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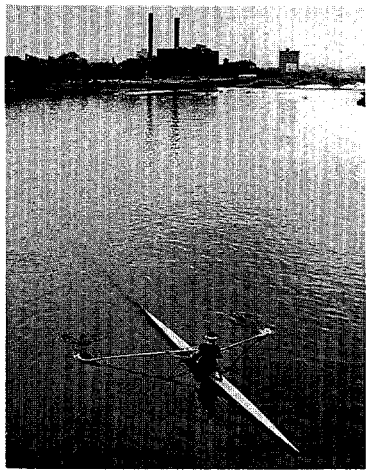
Report of the Southeastern New England Study



a Strategy for Balanced Development and Protection of Water and Related Land Resources in Eastern Massachusetts and Rhode Island

5. BUZZARDS BAY PLANNING AREA REPORT

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New England River Basins Commission

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The Southeastern New England Study (SENE) is a "level B water and related land resources study." It was conducted under the provisions of the federal Water Resources Planning Act of 1965. The resources management program the Study produced was developed by a team of federal, state, and regional officials, local citizens, and the scientific community, under the overall coordination of the New England River Basins Commission. It is a part of the Commission's comprehensive, coordinated joint plan for the water and related land resources of New England.

The recommended program for managing the resources of Southeastern New England is described, in increasing level of detail, in the following Final Reports:

A SUMMARY highlighting the principal findings and recommendations of the Study, and their implications for the future of the region.

A REGIONAL REPORT and Environmental Impact Statement describing *in detail* the natural resources, issues and problems facing the region, the alternative solutions examined during the Study, the recommendations made, and their implications. It includes policies and programs for dealing with water supply, land use, water quality, outdoor recreation, marine resources, flood and erosion protection, and key facilities siting, and the changes in state and local government required to implement the program.

Ten PLANNING AREA REPORTS dealing with the same subjects as the Regional Report, but aimed at the local level. Eastern Massachusetts and Rhode Island were divided into ten "planning areas" based either on traditional sub-state divisions or principal river basins. Reports were prepared for the following areas:

1. **Ipswich-North Shore,**
2. **Boston Metropolitan,**
3. **South Shore,**
4. **Cape Cod and the Islands,**
5. **Buzzards Bay,**
6. **Taunton,**
7. **Blackstone and Vicinity,**
8. **Pawtuxet,**
9. **Narragansett Bay and Block Island,**
10. **Pawcatuck**

Other reports prepared during the course of the Study include the following:

Inventory Reports

For each of the ten planning areas, inventory reports were prepared covering the following subjects: climate, meteorology, hydrology, geology; land use, patterns, allocations, and management; special environmental factors; water supply; ground water management; water quality control; outdoor recreation; fish and wildlife; navigation; flood plain zoning and streamflow management; inland wetlands management; coastal resources; irrigation and drainage; sediment and erosion; power; minerals.

Special Reports

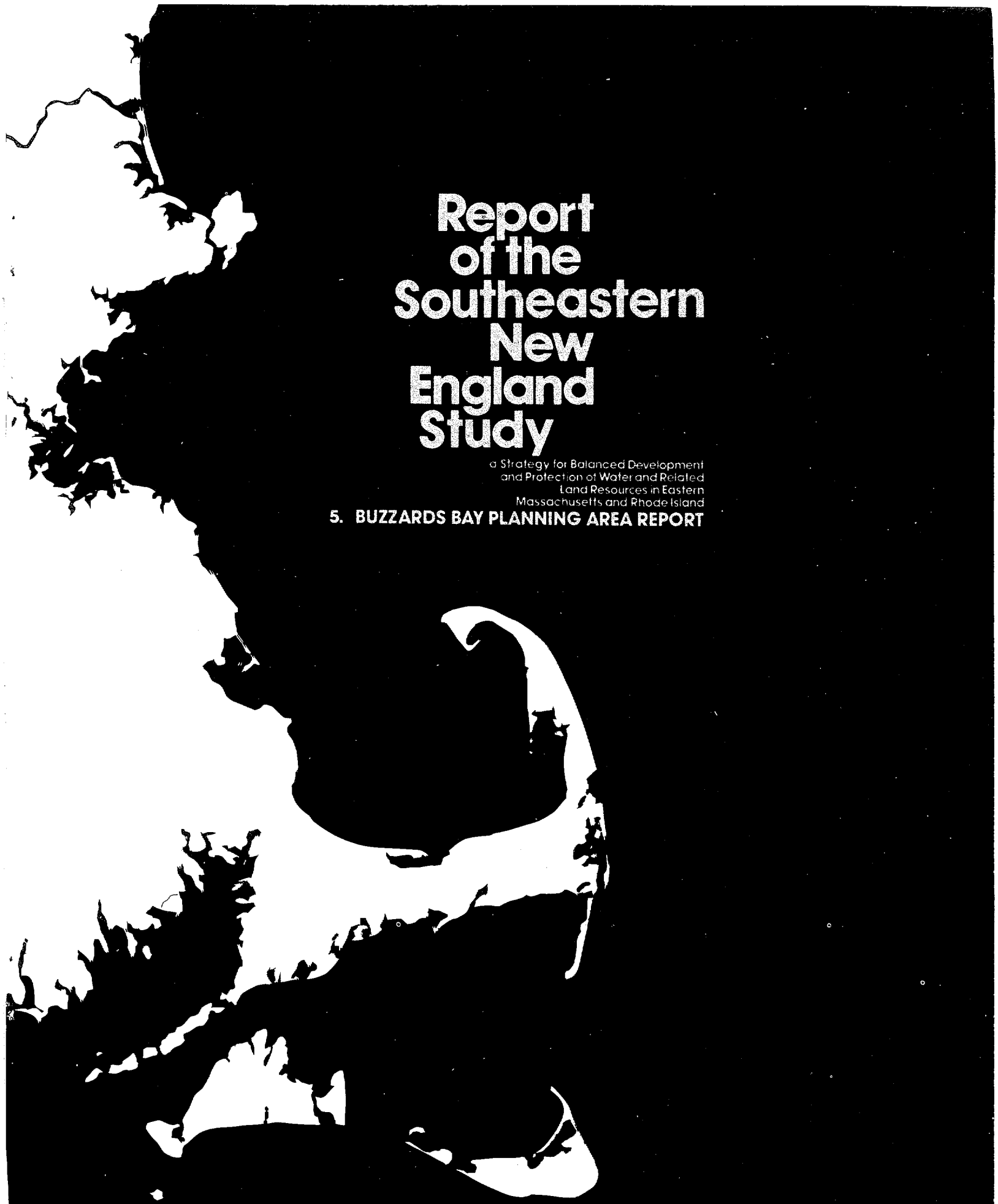
In addition to inventory reports, over a dozen special reports were prepared, including: Socio-Economic and Environmental Base Study, Volumes I and II; Economic analyses of water supply and demand issues, power plant siting, coastal resources allocation, and sand and gravel mining; Legal and institutional analyses of the state wetlands laws, arrangements for water supply service, fiscal policy and land control, access to natural resources areas, and management structure for water and land use issues; Urban Waters Special Study; Summaries of public workshops

Copies of reports are available from:

New England River Basins Commission
55 Court Street
Boston, Massachusetts 02108

National Technical Information
Service
Springfield, Virginia 22151

and also in each of the 208 libraries and 210 town halls throughout the SENE region.



Report of the Southeastern New England Study

a Strategy for Balanced Development and Protection of Water and Related Land Resources in Eastern Massachusetts and Rhode Island

5. BUZZARDS BAY PLANNING AREA REPORT

New England River Basins Commission

December 1975

SUMMARY, REGIONAL REPORT
(with Environmental Statement), and
10 PLANNING AREA REPORTS

REPORT OF THE SOUTHEASTERN NEW ENGLAND STUDY

READER'S GUIDE: HOW TO REVIEW THIS REPORT

- In five minutes

  FOR A "THUMBNAIL SKETCH"

  Read the **OVERVIEW** which folds out as one large sheet. There is an extra copy in the pocket in the rear for those who would like to mount it on the wall.

- In a half hour or less

  TO LEARN THE MAIN POINTS

  Read the **SUMMARY.** It is published separately. You can read it in either of two ways:

  - **SELECTIVELY.** Read the Chapters on Goals and Approach and Guiding Growth, plus any others that interest you. Chapters are boldly labeled to facilitate selective reading; or

  - **ENTIRELY.** Read the full summary for a fuller understanding of the highlights of the SENE Study.

- In one day or less

  TO UNDERSTAND THE DETAILS

  Read the **REGIONAL REPORT.**

  - **SELECTIVELY.** It is organized exactly like the summary. Wherever your interests lie, you can turn to those sections for additional background, amplifications, analysis of rejected alternatives, and especially for the full text of each recommendation, including who should do what and when. Also, remove the Development Capabilities Maps in the rear pocket and examine the legend to appreciate the type of information the maps portray; or

  - **ENTIRELY.** Read the full report for full appreciation of all recommendations, and how they interrelate.

- In an additional 10 minutes to 2 hours

  FOR APPLICATION TO YOUR AREA

  Get the **PLANNING AREA REPORT** for your locale. Scan it or read it to see how the broader recommendations presented in the Regional Report may apply to the area where you live or work.

TABLE OF CONTENTS

5. Buzzards Bay Planning Area Report

OVERVIEW

Buzzards Bay Planning Area

What is the point of the SENE Study program?

Balanced use and conservation of the region's water and related land resources is the program's objective. The Southeastern New England (SENE) Water and Related Land Resources Study was authorized and funded by Congress in response to the increasingly troublesome pressures the region's rapid urbanization was exerting on its rich and varied natural resources. The SENE Study has two major goals:

- To recommend actions for all levels of government and private interests to secure for the people of the region the full range of uses and benefits which may be provided by balanced use and conservation of the region's water and related lands.

- To assemble information on the resources at a consistent scale and level of detail.

What makes this Study different is that it covers a relatively large geographic area (4400 square miles), it addresses a full range of water and related land issues, and it proposes coordinated actions for all levels of government and private interests.

What does the SENE Study program cover?

The most important recommendations for this planning area include the following:

(1) To accomodate growth in environmentally and economically acceptable ways, municipalities should prohibit or restrict development on Critical Environmental Areas such as wetlands, flood plains, and well sites. Growth should be guided to Developable Areas which cover 4.87 percent of the planning area. Within this category, municipalities should manage development on resources such as steep slopes, ledge, and soils with septic system limitations. Development should be encouraged where services already exist or are planned.

(2) To provide sufficient amounts of public water supply in the Buzzards Bay planning area, substantial benefits could be realized if the City of Fall River allocated some of its unused rights from the Lakeville Ponds surface sources to New Bedford. Most of the remaining communities can rely on ground water, in some cases supplemented by supplies from the major water departments.

(3) To restore the badly polluted waters of New Bedford Harbor, and to preserve the remaining high quality waters found in the rest of the area, municipalities should press for construction of advanced wastewater treatment facilities to serve urban areas. In addition, potential contamination of ground water and surface water by disposal of solid waste leachates should be carefully studied.

(4) To meet recreational needs, significant opportunities are available for development of coastal and inland recreation facilities in the Marion, Rochester, Wareham area. The Buzzards Bay planning area coastline is relatively underdeveloped when compared to Cape Cod or Narragansett Bay. Communities should protect fragile coastal resources while managing them for the public's recreational enjoyment.

(5) To develop marine resources in an ecologically and economically sensitive manner, the local fishing industry should continue to support the establishment of a 200-mile economic zone for the region's offshore waters. Local planning agencies and financial institutions should support the fishing industry's attempts to expand and better its shore-based facilities and offshore equipment.

What will the program do?

If the recommended actions are carried out, most 1990 needs for water, sewers, electric power, and outdoor recreation could be met by making more efficient use of existing legal authorities and institutional designs. Protecting Critical Environmental Areas will avoid potential dangers to life and property from flooding, erosion, and contamination of water quality and will provide highly productive greenbelts. As a result, new growth in this planning area can be accommodated without harming the high quality environment which attracted the growth in the first place.

You can take the first step in helping to carry out the actions by reading the recommendations in the SENE Study Regional and Planning Area Report. Write your local planning and conservation officials to encourage them to use the SENE planning process when developing or implementing master plans, zoning ordinances such as flood plain and watershed protection, and other water and land use decisions.

RECOMMENDATIONS

GUIDING GROWTH (Chapter 3)

1. Protect priority Critical Environmental Areas.
2. Restrict development on other Critical Environmental Areas.
3. Manage growth on Developable Areas.
4. Use SENE resource development capability analysis to guide future growth.
5. Accommodate growth where services already exist.

WATER SUPPLY (Chapter 4)

1. Reapportion Fall River's Lakeville Ponds rights to New Bedford and Taunton.
2. Develop ground water sources in New Bedford and Acushnet.
3. Maintain close cooperation between New Bedford system and Dartmouth and Fairhaven.
4. Develop ground water sources to serve Mattapoisett and Marion.
5. Rely on ground water sources and Fall River system to supply Westport.
6. Maintain ground water as Wareham's primary source of supply.
7. Undertake well exploration, testing, and site acquisition in Buzzards Bay communities.
8. Conduct ground water survey by U. S. Geological Survey and Water Resources Commission.
9. Adopt or continue metering policies in Buzzards Bay municipalities.
10. Investigate advantages of water system cooperation in Buzzards Bay municipalities.

WATER QUALITY (Chapter 5)

1. Upgrade New Bedford's treatment facility to secondary.
2. Eliminate combined sewer discharges to Clark Cove.
3. Expand Fairhaven's existing secondary treatment facility.
4. Expand and upgrade Marion's existing secondary facility.
5. Maintain secondary treatment facility in Dartmouth.
6. Maintain secondary treatment facility in Wareham.
7. Construct advanced wastewater treatment facilities in Westport.
8. Enforce local subsurface disposal regulations.
9. Construct pump-out facilities.
10. Operate and locate landfills in accordance with sound sanitary landfill regulations.

Fish and Wildlife

8. Enforce wetlands legislation.
9. Acquire most important wildlife habitats.
10. Continue to protect and manage Westport River Islands.
11. Designate 10-acre ponds as "Great Ponds".
12. Acquire access to productive fishing ponds.
13. Acquire access to productive fishing streams.

MARINE MANAGEMENT (Chapter 7)

Offshore Fishing

1. Continue to support an interim offshore 200-mile economic zone.
2. Support national fisheries management policy.
3. Improve market for underutilized fish species.
4. Accommodate coastal fish facilities through improved planning.
5. Allow privately financed purchase of foreign-built fishing boats.

OUTDOOR RECREATION (Chapter 6)

Swimming

1. Secure public access to the shoreline.
2. Protect and manage the Westport-Dartmouth coastline.

Recreational Boating

3. Guide future marina development.
4. Make better use of existing marinas.

General Outdoor Recreation

5. Develop additional camping at Myles Standish State Forest.
6. Acquire parkland in three adjacent towns.
7. Use SENE Development Capabilities Map as open space planning guide.

Commercial Navigation

6. Improve New Bedford's navigational facilities.
7. Accommodate commercial fisheries through improved planning.

Aquaculture

8. Meet 1977 water quality standards.
9. Study estuaries for potential aquaculture operations.
10. Provide increased technical assistance to towns for aquaculture regulation.
11. Continue study of secondary treated wastewater for aquacultural use.

Urban Waterfronts

12. Coordinate local waterfront planning and development.
13. Provide guidance and set criteria for priority waterfront uses.
14. Review and coordinate waterfront use.
15. Provide federal funding for state and local waterfront development plans.

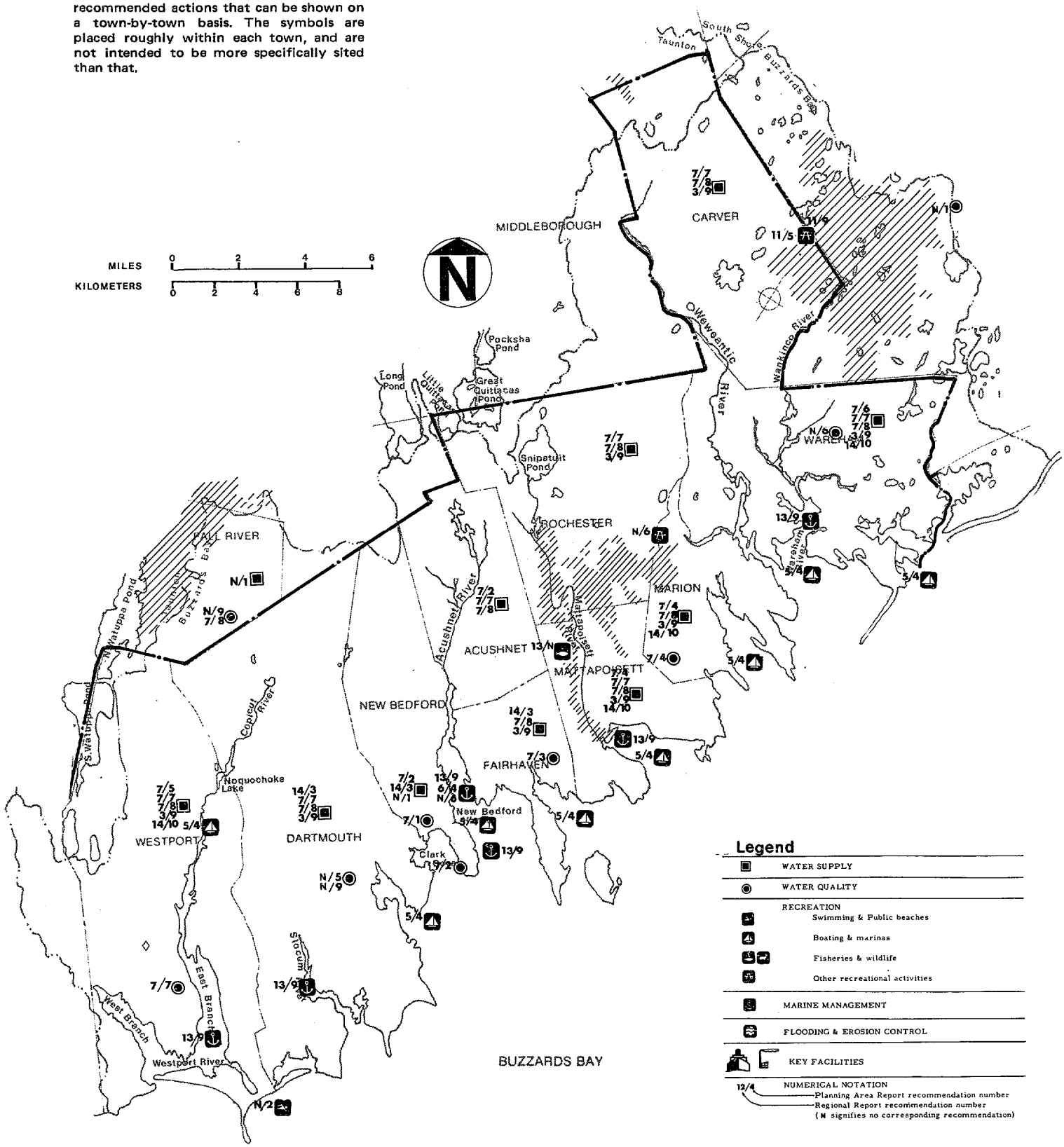
FLOODING AND EROSION (Chapter 8)

1. Adopt local flood plain zoning to prevent adverse development in flood plains.
2. Establish local sediment and erosion control ordinances.
3. Establish forest buffer zones.
4. Control forest land erosion.
5. Acquire significant flood plains and wetlands.
6. Locate in existing safe buildings in the flood plain.
7. Encourage natural stabilization of coastal erosion areas.

LOCATING KEY FACILITIES (Chapter 9)

(See Regional Report – Chapter 9)

The symbols on this map represent the recommended actions that can be shown on a town-by-town basis. The symbols are placed roughly within each town, and are not intended to be more specifically sited than that.



NEW ENGLAND RIVER BASINS COMMISSION
BOSTON, MASSACHUSETTS

SOUTHEASTERN NEW ENGLAND
WATER AND RELATED LAND RESOURCES STUDY

Buzzards Bay Planning Area
Recommended Actions

CHAPTER 1 THEMES

This report on the Buzzards Bay planning area is one of ten components of a comprehensive program for managing water and related land resources in the Southeastern New England (SENE) region. The SENE Study's Regional Report has presented recommended policies and actions from a regionwide or statewide perspective. This Planning Area Report includes applications of those broad-based recommendations to the cities and towns of the Buzzards Bay area.

One reason for preparing planning area reports is to connect the actions at the local level with the policy framework and considerations for state and federal levels. Action recommendations are made to individual municipalities in keeping with the emphasis of the SENE Study for placing decision making at the level closest to the problem, and in acknowledgement of the region's long history of local autonomy. The boundaries of the planning areas have been set along the city and town lines which most closely conform to the hydrologic boundaries of the drainage area.

The SENE Regional Report and each of the ten planning area reports are all linked by three common themes:

- **Enhancing the environment enhances the economy.** The region's reputation as a pleasant place to live will have to be maintained in order to attract the highly skilled workers characteristic of a services economy.
- **Anticipated growth can be accommodated, but it needs guidance.** Bisected by Interstate Route 195 the communities in this planning area have a special need to plan growth, yet have the unique opportunity of having time to anticipate problems and plan accordingly, due to the area's relatively low expected growth rate.
- **Existing knowledge, programs, and institutions provide the most realistic tools for achieving results, but some changes are needed.** Full use of ongoing programs with some changes in how they relate to each other, was viewed as a way of "piggy backing" on programs which have already weathered most of the realities of the political process. In choosing this strategy, the Study traded off novelty to increase achievability.

Each major chapter in the Planning Area Report suggests actions which ought to be taken in order to solve problems with continued growth or resource protection. Some of these problems are immediate, while others may not surface until after 1990, or in some cases, the next century. The intensity of these various problems is set out in Table 1.1, which compares the severity of a given problem for each planning area, and for the region as a whole.

Of the seven problem areas studied, five are major or severe issues affecting the towns of the Buzzards Bay planning area:

- **Guiding Growth.** This is one of the least rapidly growing of all 10 SENE planning areas. Growth anticipated through 1990, and nearly to 2020, can be accommodated at relatively low densities on lands which are suitable for development. This should relieve pressures on critical environmental resources and enable the area to guide its growth to suitable sites more easily than other SENE planning areas.
- **Water Quality.** The New Bedford Harbor has been seriously polluted by runoff, industrial discharges, and lack of water circulation. Municipal discharges into waters which would have difficulty assimilating the waste loads could also cause local degradation of water quality in other coastal harbors. Septic systems are in widespread use throughout the area. In high-density development zones and in soils which cannot adequately sustain them, they have become a health problem.
- **Marine Management.** New Bedford is one of the SENE region's leading fishing ports. Regional landings of fish have sustained a sharp decline since foreign fleets entered the offshore fishery in 1960. Other internal problems with costs of labor, equipment, and capital have also adversely affected the local industry. Further work needs to be done on creating new markets for undeveloped fish species.
- **Recreation.** The coastal resources of the Buzzards Bay area are among the most unique for recreation and aesthetics in the SENE region.
- **Locating Key Facilities.** Although issues concerning sand and gravel operations or major power plant siting requirements are not major in this planning area, the potential for locating such activities here is high. Such proposals will unquestionably require careful analysis in order to minimize adverse environmental and social effects.

Other significant problems in the Buzzards Bay area focus on water supply needs, agricultural runoff, access to beaches and streams, aquacultural production, and coastal flooding.

TABLE 1.1 GENERAL INTENSITY OF SENE WATER - RELATED PROBLEMS BY PLANNING AREA

Key

- ● Severe problem
- ○ Major problem
- • Moderate problem
- Blank — Minor or no problem

										Land Use Discharge																										
PLANNING AREAS	**GUIDING GROWTH (Overall)**	Protection of Critical Environmental Areas	Management of Developable Areas	**WATER SUPPLY**	**WATER QUALITY (Overall)**	Combined Sewers/Urban-Runoff	Municipal Discharges	Industrial Discharges	Low Streamflow	Septic Systems	Agricultural Runoff	Landfill Leachate	Oil Pollution	Watercraft Wastes	**RECREATION (Overall)**	Swimming	Boating	Recreational Saltwater Fishing	Camping and Picnicking	Access to Hunting and Fishing Opportunities	Passive Outdoor Recreation	**MARINE MANAGEMENT (Overall)**	Offshore Fisheries	Shellfish and Aquaculture	Port Development	Offshore Sand and Gravel	Urban Waterfronts	**FLOODING AND EROSION (Overall)**	Inland Flooding	Coastal Flooding	Inland Erosion	Coastal Erosion	**LOCATING KEY FACILITIES (Overall)**	Availability of Sand and Gravel	Power Plant Siting	Petroleum Facilities Siting	Solid Waste Management
Ipswich - North Shore	●	○	●	○	○	•	○	•	○	●		○	•	•	•	○	●	•	●	○	○	•	●	○			•	○	•	○		•	○	○	●	•	
Boston Metropolitan	●	○	○	●	●	●	●	●	•			○	○	•	●	●	●	○	○	●	●	○	○		●	○	●	•	○	•		•	○	○		●	
South Shore	○	•	○	•	○		○	•	○	○	•			•		●	○			○	:			•				○		○		•	○	○	○		
Cape Cod and the Islands	○	●	•	○	•		○			●	•	•		○	•		•		○	•				•						•		•		○			
Buzzards Bay	•	●			○	●	○	○		•	○			•	○		•			•		•	●	•			•			•					○		
Taunton	○	●	•	○	●	○	●	●	○	○	○		•		•	●			○	•	•						•	•		•			•				
Blackstone and Vicinity	●	•		●	●	●	●	●	•	•		○	○		○	○	○		○	●	○	•			○	○	●	●	●	•			•				
Pawtuxet	○	•	•		●		●	●	●	•					•	●		•		○								○	●					○			
Narragansett Bay	○	●	●	○	○	●	○	•					○	○	•	○	○	○		○	○	○	●	•	●		•	○		○		•	○		○	●	
Pawcatuck	•	○			•		○	○		○				•			•			•				•				•		○		•			○		
REGION AS A WHOLE	●	○	○	●	●	●	●	●	○	○	•	•	•	•	○	○	○		○	○	○	○	○		○	•	•	○	•	○		•	●	○	●	○	○

CHAPTER 2 THE SETTING

The Buzzards Bay planning area lies between Cape Cod and Narragansett Bay, covering 299 square miles or about 206,000 acres, along the south coast of Massachusetts. The ten towns in the Buzzards Bay planning area are as follows:

Acushnet	Mattapoisett
Carver	New Bedford
Dartmouth	Rochester
Fairhaven	Wareham
Marion	Westport

Seven of the more important streams in this area are the Wareham, Weweantic, Sippican, Mattapoisett, Acushnet, Slocum, and Westport Rivers. They flow through low and gently rolling terrain, much of which is less than 100 feet above mean sea level. Some of the northern portions of communities in the area, however, are hilly and approach 200 feet in elevation. Glacial till and outwash deposits have formed the soils over the greater part of the Buzzards Bay area.

While upland portions of the planning area are characterized by a number of lakes and ponds, swampy lowlands are more typical features of the region. The lowland topography is exceptionally favorable for cranberry bogs, which are located throughout the northeastern Buzzards Bay communities. Forest cover in this area is principally scrubwood, reforested fields, and brushland, except for the many swamps which are wooded with cedar and red maple.

Although the straight-line distance along the shore is approximately 32 miles, the actual shoreline is about 210 miles long. Bays, coves, and promontories create an extremely irregular coastal outline and offer a few sheltered anchorages and harbors. A major Massachusetts state beach, at Horseneck Point in Westport, is one of the most actively used coastal facilities between Providence and Cape Cod. While many of the headlands are either bedrock outcrops or gravel bluffs, there are many pockets of broad tidal marshes and shallow, sandy coves which make up the Buzzards Bay coastline.

Most of the waters in the planning area are clean enough to swim in, but the relatively shallow New Bedford Harbor and Acushnet River, nearly cut off from the ocean by a hurricane barrier, have severe water quality problems. The major sources of pollution include wastewater from ocean outfalls, combined sewers, and domestic and industrial sewer outlets. In addition, vessel pollution, malfunctioning septic systems, pesticides, and landfills pose pollution problems.

The population of the Buzzards Bay planning area was about 178,400 in 1970, or about 3.7 percent of the total population of Southeastern New England. This represented the fifth largest population of the ten SENE planning areas. In terms of absolute population growth, however, the Buzzards Bay area had the second smallest increase in the region, only 9.6 percent, or about 15,600 between 1960 and 1970. This figure was only 1.6 percentage points higher than the average for the region. Its overall population density of .87 people per acre places it as one of the four lowest density planning areas in the SENE region. This condition is expected to continue through 1990, with the population projected to increase only 12 percent, to about 200,000 people. Most of the highest density is expected to continue to locate in municipal centers along the coast. This could potentially aggravate the pollution and flooding problems already experienced in coastal communities.

In 1970 there were 64,200 persons working in the planning area. In absolute size, it was the fifth largest employment center in Southeastern New England. The growth in employment during the sixties of about 12,000 gave it the sixth largest increase in number of jobs among all ten basin planning areas. As a result, only one out of every 20 new jobs in the region was located in the Buzzards Bay area. Of those new planning area jobs, only one out of every five occurred in retail activities, with 60 percent of that new retail trade employment in New Bedford. Services such as utilities, business, medical, private education, architect-engineering, research and development operations, and consulting firms, were even more important, accounting for almost half of the new jobs in the area. While manufacturing employment declined by less than one percent, it remained the single most important employment sector in the Buzzards Bay planning area, totalling 27,000 jobs in 1970. This differs from the SENE region as a whole, which appears to be turning away from an industrial-based economy toward a service-based economy. Nationwide employment figures still show industry as the biggest employer for the country's work force.

As one of the leading fishing ports on the east coast, New Bedford is undertaking a vast urban renewal program in the waterfront area. This project is aimed at improving the economic status of the city's historic waterfront commercial district. However, while harbor improvements could help the fishermen, overfishing of Georges Bank and other offshore fishing grounds by modern, well-equipped foreign fleets has severely affected the New Bedford fishing industry.

In 1969, per capita income of people employed within the Massachusetts coastal economic subarea averaged about $2800 in 1967 dollars. The Fall River-New Bedford economic subarea, however, averaged substantially more: $3200, which reflected the heavy concentration of industrial and manufacturing jobs there. Nonetheless, these averages are still *lower* than the $3400 national average for the same period; moreover, the coastal Massachusetts average was $300 *less* than the coastal Rhode Island earnings. It should be noted that these figures are averages which give a relative order of magnitude to incomes of persons employed within the *entire* coastal area of the state, and are not meant to be *exactly* representative of the average real income of all Buzzards Bay area residents.

Early in the Study at public workshops held in the planning area, Buzzards Bay residents indicated strong support for limiting continued growth in per capita consumption of water, with a reliance on local ground water and the development of the Lakeville Ponds for water supply. There was a clear preference for the construction of one regional treatment facility using advanced wastewater technology, and the treating of all combined sewers in a detention chamber system. Participants felt that wetlands could be better protected by strengthening existing legislation, adding technical personnel at the state level, and purchasing key wetlands with public funds. And, although they most preferred expanding existing recreational facilities as well as purchasing new ones, they also wanted those facilities to serve multiple recreational uses.

Later during the 90-day review period, over 275 state, regional, and municipal officials, federal agencies, and concerned citizens submitted comments on the Study's draft reports. The major comments are summarized in the Regional Report chapter, *"Review of the Report."*

There were several major changes in the Buzzards Bay Planning Area Report. In response to the concerns of municipal officials and local residents regarding pesticide pollution, the diversion of the Weweantic River to meet mid- and long-term water supply needs in the City of New Bedford has not been recommended in *Chapter 4.* Instead, the exploration of ground water in three locations and an investigation of the feasibility of raising the dam at Acushnet Reservoir to increase the storage capacity are recommended. Westport and Dartmouth residents objected to the draft recommendations in *Chapter 6* for expanding Horseneck State Beach and for state acquisition of the Westport Islands and for expanded marina development in the Westport River estuary. The recommendations were changed to local protection and management of the fragile resources for local and non-local use because of the commitment of municipal officials and residents to do this. The recommendation to encourage marina development was tempered to reflect citizens' and local officials' concerns that marina growth be controlled.

Several implications can be extracted from the preceding profile:

(1) The Buzzards Bay planning area was one of the slowest growing planning areas in Southeastern New England during the sixties. It is thus in a unique position, for it has the opportunity to act before development overwhelms the area. The next few years represent a crucial opportunity to protect the Bay area's fragile resources and to channel growth to environmentally sound, yet economically feasible, sites.

(2) Clean water is especially important in this planning area because Buzzards Bay is an excellent recreational resource and has great potential to help meet the recreational needs of the SENE region.

(3) The Buzzards Bay area has a long and colorful seafaring tradition. Although it is one of the most active of SENE's fishing ports, New Bedford's principal problem is massive overfishing of offshore fishing grounds. Thus, conservation of these offshore resources is imperative.

(4) Water needs are expected to rise steadily in the next fifteen years, despite low to moderate development pressures. However, because of the recreational potential of the area, much of the water demands are expected to be seasonal.

(5) The numerous inlets, bays, harbors, streams, and flats in the Buzzards Bay planning area present potential opportunities for aquaculture. With improved water quality, the opening of flats previously closed by pollution could double the available shellfish resources.

(6) The planning area's flat terrain, and extensive network of coastal streams and wetland areas, have played a major role in minimizing inland flooding. Although there has been little significant inland flood damage, the Buzzards Bay area is subject to infrequent, but locally severe coastal flooding and erosion, particularly from hurricanes.

CHAPTER 3 GUIDING GROWTH

Between 1960 and 1970, the Buzzards Bay area grew only 9 percent, from 163,000 people to 178,000. In contrast, other planning areas in the SENE region grew by as much as 30 to 50 percent over the same period. Most of the growth in Buzzards Bay communities took place in scattered low-density development, ranging throughout the cities and towns of the planning area. Municipalities experiencing relatively high population gains included Westport, Dartmouth, and Wareham, while the city of New Bedford, with a 10-year increase of only 2600 people, registered the highest population growth of the area. Based upon this overall trend, it is expected that the Buzzards Bay planning area will continue to be one of the less-rapidly growing SENE planning areas through 1990. Over the next 50 year period, from 1970 to 2020, population is expected to increase only by about half its present 178,000 residents.

A unique opportunity exists for the Buzzards Bay cities and towns to wisely plan their future development in a manner that is sensitive to the area's unique environmental resources. But steps must be taken now to ensure that this comes about. While only 14 percent, or some 29,000 acres, of the area's total 205,000 acres is presently urbanized, this represents a 65 percent increase over 1960 totals. The area's rural-coastal character is beginning to feel the inexorable press of urban sprawl. Agricultural lands have declined 10 percent, forest lands have lost 7 percent, and coastal wetlands four percent of their individual 1960 total acreage. With 63 percent, or about 98,000 acres of the remaining urbanized land suitable for future urban development, there should be little problem locating the 18,000 acres needed to absorb the potential 1990 growth.

The key to accommodating this growth will be the manner in which it is distributed across the landscape. Various important resources are scattered fairly evenly throughout the planning area and ought to be considered when developing land use plans and policies.

There is a growing concern among local residents that future development should be located in a way which lessens the conflicts with remaining land and water resources. As pointed out in Chapter 2 of the Regional Report, these resources contribute greatly to the region's quality of life and its economic competitive standing with other areas in the nation. If proper planning steps are taken, much can be done to ensure that this quality of life will continue. This chapter describes current land use trends in the Buzzards Bay area, and the capabilities of its resources to accommodate future growth. It concludes with recommended strategies for guiding growth in an economically and environmentally sound manner.

The Situation

Anticipated Growth

As previously mentioned, the Buzzards Bay planning area is one of the least rapidly growing of all SENE planning areas. The landscape is covered with a patchwork of wetlands, flood plains, streams, and coastal marshes which are locally coming under moderate pressure for filling and development. With the exception of the New Bedford urban core, whose waters are severely degraded, the area's remaining high quality waters have begun to show signs of increasing pollution from the impacts of this development.

The rates at which parts of the planning area will be urbanized will vary to some extent with relative development pressures. These pressures were estimated for SENE communities on the basis of a formula using factors such as the rate of growth of residential, commercial, and other uses, the relative accessibility of an area to employment and population in other parts of the region, and the availability of easily developable land. The precise process for grouping towns by development pressure is described in *Chapter 3 of the Regional Report.* While use of other factors, such as recent building permits or land consumption rates, may produce different results, combining the factors used gives

TABLE 3.1 MUNICIPALITY BY DEVELOPMENT PRESSURE: BUZZARDS BAY PLANNING AREA

High	Medium-High	Medium-Low	Low
Dartmouth	Acushnet Marion Mattapoisett Rochester Westport	Carver Fairhaven New Bedford Wareham	none

Note: Communities are grouped into levels of development pressure relative to other communities in the Study region and do not necessarily reflect local building activity.

some useful indication of development pressure in the communities in the planning area, relative to all SENE communities. Table 3.1 shows the development pressure for the planning area cities and towns.

Accommodating Growth

In 1970, about 14 percent of the total land area of the Buzzards Bay area was devoted to urban uses – housing, industry, schools, commercial, etc. Population and employment growth during the decade resulted in an increase in urban development of 12,000 acres, or almost 65 percent – from 17,000 acres in 1960 to 29,000 acres in 1970.

For every increase of 1.2 persons, one acre of unurbanized land was converted to some form of urban use during the sixties. Of the land which is urban, about 76 percent is devoted to high intensity use such as commercial, high density residential, multi-family or apartment units, industry or transportation uses. Medium intensity uses such as ½ acre to 1 acre residential lots, occupy about 17 percent of the urbanized area, while low intensity development (lots greater than an acre) take up about 17 percent of the urbanized land. But it is worth noting that developed areas can be used -- and further, that use and reuse of such land can be highly efficient.

If the urban land consumption rate of one acre for every additional 1.2 persons should continue to 1990 and 2020, an estimated 18,300 acres of land would be converted to urban use by 1990, and another 93,000 acres

TABLE 3.2 THE SENE RESOURCE DEVELOPMENT CAPABILITY SYSTEM

CRITICAL ENVIRONMENTAL AREAS REQUIRING PROTECTION

Water Bodies (Category A), blue. [Includes estuaries, shellfish flats, and fish spawning areas.]
Priority Protection Areas (Category A), dark green: wetlands, well sites, beaches, and critical coastal erosion areas.
Other Protection Areas (Category B), light green: flood plains, class I and II agricultural soils, unique natural and cultural sites, [proposed reservoir sites and related watersheds, and upland erosion areas] excluding all "A" areas.

DEVELOPABLE AREAS REQUIRING MANAGEMENT, Excluding All A & B Areas

WATER RESOURCE LIMITATIONS
Aquifers and/or Recharge Areas (Category C_1) black dots: highest yield aquifers in each basin.

WILDLIFE AND SCENIC RESOURCE LIMITATIONS
Wildlife Habitat (Category C_3), black diagonal lines: best upland wildlife habitat other than publicly owned land and [commercial fishing grounds].
Landscape Quality Areas (Category C_2), black vertical lines: land characterized by high landscape quality other than categories C_1 and C_3.

SOILS RESOURCE LIMITATIONS
Ledge and/or Steep Slope (Category C_5), brown: land with slope greater than 15 percent and/or with rock near the surface.
Severe Septic System Limitations (Category C_4), orange: land with severe septic system limitations other than Category C_5.
Moderate to No Septic System Limitations (Categories F and G), yellow: land with moderate or no septic system limitations.

PREEMPTED USE AREAS

Urban Areas (Category E), gray: residential[5]/institutional, commercial and industrial development.
Publicly Owned Lands (Category D), beige: major public parks, forests, watersheds, and military lands.

Notes:

1/ All categories above, except those within brackets, are depicted on the development capabilities maps (plates 1, 2, 3).

2/ Categories in brackets are included to show where they would fit in the overall classification hierarchy, were they included on the plates in the pocket.

3/ All categories above, including those within brackets, are depicted on large-scale, unpublished maps available for inspection as part of the SENE Files.

4/ Categories C_1, C_2 and C_3 overlap with categories C_4, C_5, F, or G. Thus, Category C_3-C_4 is a wildlife habitat located on ledge or steep slopes.

5/ Mapped urban areas (Category E) include all-residential development, although the legend on Plates 1, 2, and 3 reads "residential areas on less than one acre lots."

of urban land would be needed during the last 30 years of the forecast period. Thus by 2020, the total population increase would require a total of 111,300 acres of urban land, or 57 percent of the planning area's total land acreage.

As mentioned, the SENE Study inventory of land resources has identified only 98,000 acres that are suitable for future development. Such an identification was accomplished by mapping surface water, high-yield ground water areas, wetlands, flood plains, soils suitable for septic systems, steep slopes, ledge, wildlife habitat, and important natural areas, among others. The mapped information was then overlayed and the most Critical Environmental Areas were identified. On the basis of the amount of land suitable for development and the past land consumption rate, an estimate was made of the size of population that the planning area could accommodate.

The results of this process indicate that there is, generally, enough suitable land to accommodate growth in the Buzzards Bay area through 1990. However, these suitable lands may not necessarily be located where the pressures for growth are highest. As a result, the more critical resources (those lands which due to their intrinsic qualities ought not be heavily developed) have been identified to provide guidance for local, regional, and state land use planners. This approach was taken so that initiative could remain at the local level for guiding development to suitable sites, while providing backup for continued, and strengthened, protection of critical water and related land resources.

Guiding Growth

To properly assess the methods for guiding future growth based upon the region's water and related land resources, these resources were singled out and individually inventoried and mapped, as previously noted. Based upon each resource's intrinsic values, and on existing or proposed legislative guidelines, those with similar characteristics were grouped into broad categories.

Table 3.2 presents the various types of land uses, among which are the three major resource types: Categories A, B, and C. Two of these, Categories A and B, are classified as **"Critical Environmental Areas".**

The most fragile and valuable of these are **Priority Protection Areas (Category A),** in which any development threatens public health, safety, and welfare: water bodies, wetlands, well sites, beaches, critical erosion areas, estuaries, shellfish flats, and fish spawning areas. **Other Protection Areas (Category B),** which can retain their usefulness only under certain kinds of limited development are: flood plains, prime agricultural soils, unique natural and cultural sites, proposed reservoir sites, and upland erosion areas.

The remaining unurbanized lands must be managed with varying degrees of regulations to protect certain values. These have been mapped on Plate 2 as **Developable Areas** requiring management (Categories C, F, and G) and include: ground water recharge areas, best upland wildlife

TABLE 3.3 PERCENT OF LAND AND WATER RESOURCE CATEGORIES IN EACH PLANNING AREA

Planning Area	Total (in 1000's of acres)	Percent (%) of Planning Area				
		Critical Environmental Areas			Developable Areas	Preempted Use Areas
		A	B	A & B	C, F, G	D, E
Ipswich-North Shore	274	19	13	32	34	34
Boston Metropolitan	421	14	9	23	30	47
South Shore	172	17	13	30	43	27
Cape Cod & Islands	378	10	23	33	32	35
Buzzards Bay	205	17	16	33	47	20
Taunton	351	19	22	41	37	22
Blackstone & Vicinity	410	10	11	21	38	41
Pawtuxet	180	11	7	18	41	41
Narragansett Bay	212	16	16	32	34	34
Pawcatuck	262	27	12	39	40	21
SENE	2,865	16%	15%	31%	36%	33%

Sources: See Methodology in the Regional Report.

habitat, high landscape quality areas, ledge and steep slope, severe septic system limitations (Category C), and moderate to no septic system limitations (Categories F and G). Use of remaining lands (Categories D and E) is generally preempted by development or public ownership.

These land and water resources have been mapped for the Buzzards Bay planning area on Plate 2, where they have been combined with the resources of other planning areas in the southeastern Massachusetts subregion. The relative amounts of Critical Environmental Areas, in Categories A and B, Developable Areas in Categories C, F and G, and Developed or Preempted Categories D and E are displayed for the ten SENE planning areas on Table 3.3. Table 3.4 presents suggested guidelines for the suitable uses of the Developable Areas mapped on Plate 2.

Critical Environmental Areas comprise about 33 percent of the Buzzards Bay total land and water area of 205,000 acres. This is slightly higher than the regional average of 31 percent and equals about 67,000 acres of combined A and B resource types.

Category A – Priority Protection Areas cover about 17 percent of the planning area. The diversity of these resources will be examined further in the following chapters of this planning area report, but, as noted above, they combine to significantly enhance the quality of life available in the Buzzards Bay coastal drainage area. Although most of these resource types are fairly evenly distributed throughout the area, the Westport River watershed towns of Westport, Dartmouth and eastern Fall River have a majority of the area's inland **wetlands**. Additional wetlands, ponds, and cranberry bogs are scattered through Rochester, Carver, and eastern Middleboro. The Taskamansket River which bisects Dartmouth is another important resource. Although the 5,000-odd acres of coastal wetlands remaining in Wareham, Marion, Mattapoisett, Fairhaven, Dartmouth, and Westport in 1970, had declined about 4 percent from the 1960 acreage, inland wetlands have remained relatively intact. *Chapters 6 and 8 of this report* discuss the value of wetlands for flood storage, aquifers, plant and wildlife habitat, and other purposes.

Another 16 percent of the planning areas is covered by **Category B, Other Protection Areas** not already included in A resources. While other planning areas have significant amounts of inland **flood plains** (23,000 acres or more, on the average), the Buzzards Bay area has a relatively low total of 17,950 acres. More important is the extreme danger caused in the 18,000 acres of tidal flood areas as a result of houses which have been built in those zones. Some of the highest land use densities are to be found along the beachfront in Wareham, Marion, Mattapoisett, and Fairhaven. Certain of these **beaches** are **critical high-hazard storm damage zones** which continue to sustain damage in each succeeding hurricane season. *(See Chapter 8, Flooding and Erosion, in this report).* Unique natural and cultural sites are also included in Category B resources.

Developable Areas (Categories C, F, and G mapped on Plate 2) make up 63 percent of the remaining unurbanized land. If land development continues at its present rate, there are suitable developable lands to handle growth through 1990. Assuming a continuation of present land consumption and zoning controls, there is enough land in the Buzzards Bay municipalities for about 117,600 additional people. The expected 2020 increase in population is 93,000. This land surplus puts the Buzzards Bay area in good standing relative to other areas in the SENE region, which will be facing a deficit of suitable areas after 1990. The potential therefore exists for this planning area to absorb a portion of excess population from other planning areas in SENE.

Development on **slopes of over 15 percent** gradient, which are scattered throughout the area, can cause risk of soil erosion, undermining of foundation walls, and septic system seepage to areas below. High density development on **soils with severe limitations for septic tank systems** must be regulated to prevent health hazards, or provided with sewer service. **Prime agricultural lands**, which have been disappearing rapidly, represent an inevitable resource loss. Remaining prime agricultural lands must be protected. **Important wildlife habitats**, and **high landscape quality areas** contribute in a cumulative way to the ambience of the Buzzards Bay area.

The 1990 design capacity of sewer systems in the planning area is expected to be sufficient to service 193,000 people. Considering those presently served or expected to need service by 1990, this capacity can serve 45,000 additional people, or half the projected increase in population by 2020. This amount of sewering may be sufficient, if care is exercised to prevent development on areas with severe septic system limits of a density requiring sewers.

In addition to decisions about guiding future residential growth, and concomitant commercial growth, to proper sites, the Buzzards Bay area may be confronted with several problems at a more regional level. **Key facilities** and large scale developments of more than local concern are being considered for siting here, sustaining the economic growth of the SENE region and serving the needs of the population as a whole. Unfortunately, activities such as power plant operations and sand and gravel mining can have locally significant adverse impacts upon water and related land resources.

The demand from industrial and domestic users for power is steadily growing, but few sites exist that meet requirements for power plants with minimal degradation of the environment or safety hazards. Additionally, while sand and gravel operations are not the regional issue here that

TABLE 3.4 SUGGESTED* GUIDELINES FOR USE OF DEVELOPABLE AREAS SHOWN ON PLATES 1, 2, and 3

MAP COLOR	MAP PATTERN: Other Resource Limitations / Soils Limitations	NONE (color only): No other Resource Limitations	High Landscape Quality (Category C_2)	Upland Wildlife Habitat (Category C_3)	Aquifer and/or Ground water recharge areas (Category C_1)
YELLOW	Moderate to No Limitations for septic system disposal (Category F & G)	- PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU	If clustered on no more than 50% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU Unclustered - . Low Intensity I/C . At least 1.0 ac/DU	If clustered on no more than 30% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU Unclustered - . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 20% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At Least 1/2 ac/DU Unclustered - . Med. Intensity I/C . At least 1/2 ac/DU Unclustered or no PW & PS - . No I/C . At least 3 ac/DU**
ORANGE	Severe septic system limitations caused by conditions other than slope and ledge soils (Category C_4)	- PW & PS . Any I/C . Any Res. - PW only . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 50% of area - - PW & PS . Any I/C . Any Res. Unclustered or PW only - . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 30% of area - - PW & PS . Any I/C . Any Res. Unclustered or PW only - . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 20% of area - - PW & PS . Any I/C . Any Res. - PS only . Med. Intensity I/C . At least 1/2 ac/DU - PW only . No I/C . At least 3 ac/DU
BROWN	Ledge and/or steep slope greater than 15% (Category C_5)	- PW & PS . No I/C . At least 1/2 ac/DU *** - PW only . No I/C . At least 2 ac/DU	. No I/C . At least 3 ac/DU	. No I/C . At least 3 ac/DU	. No I/C . At least 3 ac/DU

* These are designed to provide a framework for designing guidelines of increasing specificity by state, regional, and local planners, and consultants more intimately knowledgeable with local circumstances.

** In many cases suggested guidelines for development, particularly for ground water, are estimates of probable safe controls made in the absence of greater knowledge of the effects of development on the pollution of aquifers.

*** Erosion control measures should accompany other restrictions on slopes over 15%.

Med. & Low Intensity - refers to water use/effluent discharge/building coverage

Clustering – refers to percent impermeable land surface area which may adversely effect the resource.

PW - Public Water Supply System
PS - Public Sewer System
I/C - Industry/Commercial
Res. - Residential
ac - acre
DU - Dwelling Unit

they are in other planning areas, there are large deposits which might be tapped. Unfortunately, the best sand and gravel sites are frequently aquifer recharge areas, and care must be exercised to prevent pollution or depletion of the ground water. These are discussed further in the *Regional Report's Chapter 9, Locating Key Facilities.*

Thus, given all of the factors cited above, the expansion of municipal systems and the population growth for this planning area imply that:

(1) The major population pressures upon this area will not tend to occur until after 1990. There will be enough acres of developable land available to accommodate growth in the interim.

(2) The danger is that, in the meantime, scattered development will occur, utilizing that land with high yield ground water, ledge, or land with severe septic system limits. Once such scattered development occurs, it becomes almost impossible to ever regain control and organize the use of land in such a way that it protects both land and water resources.

(3) Uncontrolled growth would irrevocably destroy fragile coastal areas and should be carefully controlled.

Thus, as mentioned above, the Buzzards Bay planning area is in a unique position because its residents have the opportunity to act before it is overwhelmed by development. The next few years represent a crucial chance to bring about major changes. By 1990, approximately 22,000 persons will have to be accommodated using about 20,000 acres of the 98,000 acres available. Further, it must be remembered that Buzzards Bay has great potential to help meet the recreational needs of Southeastern New England.

The Solutions

To take advantage of the Buzzards Bay planning area's potential for accommodating growth without significantly changing the overall quality of the environment, a three-part program is recommended for the local level: (1) Protect SENE Category A, Critical Environmental Areas; (2) Restrict development on Category B, Critical Environmental Areas; and (3) Manage growth on Category C, F, and G resources while guiding growth to areas with existing infrastructure.

Several methods exist for protecting the fragile or critical resources listed on Table 3.2, including: existing legislation, zoning, building codes, subdivision regulations, purchase of easements, or transfer of development rights. Within the context of these available methods for preserving critical resources, the following actions are recommended:

1. **Protect priority Critical Environmental Areas. Municipalities should prohibit urban development on Category A Critical Environmental Areas (Priority Protection Areas). The appropriate uses of these resources include water supply, fisheries and shellfish production, low-intensity recreation, and scenic or open space lands.**

Land and water resources within Category A are shown on Table 3.3. These Critical Environmental Areas include several kinds of resources. Local planning boards and conservation commissions should protect **water bodies** from pollution by restricting adjacent development and by enacting specialized subdivision regulations which require stormwater detention ponds where feasible. *Chapter 5* of this report also makes recommendations which will help to achieve the state's water quality standards. **Tidal estuaries and shellfish flats** should be protected by prohibiting outfalls of polluting effluents, and by restricting dredging, filling, or installation of pipelines. **Wetlands** should be protected through more rigorous enforcement of existing legislation by both state and local officials *(see Chapter 6* for local assistance suggestions, and *Chapter 8* for legislative improvements).

Municipalities, using Massachusetts Self-Help Funds, and private groups such as Audubon and Trustees of Reservations, could acquire the more valuable wetlands for wildlife or natural areas habitat along with their surrounding uplands as listed in *Chapter 6.* **Beaches and critical erosion areas** should be protected by zoning ordinances and selective purchase to prevent incompatible urban development, as mentioned in *Chapters 6 and 8.*

A similar recommendation is made for the management of Category B Critical Environmental Areas needing protection:

2. **Restrict development on other Critical Environmental Areas. Municipalities should restrict development on Category B Critical Environmental Areas (Other Protection Areas). Suitable uses to be considered for this category should include agriculture, extensive recreation, forestry, or in some cases with proper management, very low density residential use.**

Measures for protecting **flood plains,** described in *Chapter 8 of the Regional Report,* include local flood plain zoning which prohibits adverse development, discouraging or prohibiting reconstruction after substantial storm damages, and relocating some public facilities if structural protection is not practical. Structural methods required to remedy flooding problems in this planning area are described in *Chapter 8 of this report.* **Prime agricultural lands** should be protected by legislation enabling tax incentives and agricultural districts and by acquisition of development rights for the highest priority lands *(see Chapter 3, Regional Report, also).*

Proposed **reservoir sites** and **unique natural and cultural sites** should be protected by acquisition, easement, or development rights. **Upland erosion areas** should be protected by local sediment and erosion control ordinances *(discussed in Chapter 8 of the Regional Report).*

The nearly 98,000 acres of Developable Areas (Category C, F, and G resources) require some management to retain the intrinsic natural functions which these resources perform. The SENE Study recommends:

3. **Manage growth on Developable Areas.** **Municipalities should manage growth on Category C resources and encourage growth on Category F and G resources, especially where infrastructure exists or is planned.**

It is worth noting that this recommendation deals with management of all developable areas, both within existing developed areas, and in areas yet to be developed: There are no developable areas in which management of some kind is not required.

On ground water recharge areas, communities should restrict densities so that septic systems will not endanger ground water quality. Densities requiring sewers should be allowed only after analysis of the economic and environmental feasibility of recharge maintenance techniques to prevent depletion of the aquifer. For details about suitable uses of these lands, refer to Table 3.4, and also see the *Regional Report, Chapter 4, Water Supply, and Chapter 5, Water Quality.* Other ordinances and building codes should control coverage by impermeable surfaces, require stormwater detention basins to return runoff from roofs, streets, parking lots, and driveways to ground water. Land use regulations should restrict activities hazardous to ground water quality such as sanitary landfills operation, highway deicing salt use, industrial waste discharges, agricultural runoff, and sand and gravel mining below the water table. On areas with **high landscape quality, best upland wildlife habitat**, and on unsewered **soils with septic system limitations** only development of very low density should be allowed. Development that would tend to preempt the resource value of wildlife habitat and landscape quality should be carefully evaluated to ensure that adverse impacts are fully taken into account. **Steep slopes** should be protected from erosion by low density use. Development on moderate limitation areas should be regulated to correspond to the availability of sewers. Higher densities should be encouraged on **F and G lands.**

Although many local governments have the authority to implement the concept of guiding growth based on resource capability, its implementation will be most effective if adopted as a matter of state policy. This is because not only do the resources extend beyond town boundaries, but also because additional funds and expertise exist at the state level. The most expedient way for the state to implement these concepts would be for its interagency policy council to review and adopt as appropriate the policy issues suggested in this report.

Rhode Island has taken a step in this direction by putting together a comprehensive land use plan. Massachusetts should continue to progress towards developing a comprehensive policy for guiding growth. This decision is most appropriately made by an existing interdisciplinary organization; it is therefore recommended that the Commonwealth of Massachusetts:

4. **Use SENE resource development capability analysis to guide future growth. The Massachusetts Cabinet, with the active participation of regional planning agencies and municipal governments, should review and use the SENE Study's resource development capability analysis to develop a policy for guiding future growth. Guidelines can be developed at the state, regional, or local levels of government** *(See Chapter 10 of the SENE Regional Report).*

Chapter 3 in the Regional Report describes the economic inefficiencies and environmental costs of urban sprawl. Making better use of roads, sewer systems, and water supply systems where they already exist could help to avert those costs. Therefore, it is recommended that policies be developed to:

5. **Accommodate growth where services already exist. The Massachusetts Cabinet, in conjunction with municipalities, regional planning agencies, and state agencies, should establish policies to accommodate further development in already developed areas, and to permit maximum use of existing water, sewer, and transportation services. Planned unit development and the cluster principle should also be encouraged in these areas.**

The *Regional Report* also recommends establishment of a system for determining criteria for locations of developments of regional impact. This would be within the framework of the system designed to protect critical areas and manage others, and would enable consideration of environmental and economic ramifications of siting decisions. Power plant siting problems in this planning area would be under its jurisdiction. Details of this recommendation can be found in the *Locating Key Facilities chapters of this report and the Regional Report, and Chapters 3 and 10 in the Regional Report on Guiding Growth and Strengthening the Management System for Natural Resources.* Consistent with siting criteria suggested for other facilities of regional impact, highway planners should give special consideration to avoiding Critical Environmental Areas (Categories A and B).

Priorities

While the Study encourages all municipalities to undertake this development strategy, the need is especially urgent in those with proportionately higher amounts of Critical Environmental Areas which will be under increasing development pressure. Based on the discussion in the *Situation section of this chapter,* these municipalities are: Dartmouth, Acushnet, Marion, Mattapoisett, Rochester, and Westport.

Implications

The impact of these recommendations on development patterns in the planning area, considering the amounts of area in each category and projected population, should be significant. Application of SENE Study recommendations in Buzzards Bay communities can make an important difference in trying to ensure that the area continues to be an attractive place to live, work, and spend leisure time. It will concurrently have the effect of preserving existing and future water supplies, improving water pollution problems, and reducing coastal and inland flooding damages.

Although Category A and B Critical Environmental Areas comprise 67,000 acres and 33 percent of the planning area, there is adequate area left for future development. In fact, most, if not all, of the growth anticipated over the next 20 years can be accommodated on lands capable of sustaining that development with minimum environmental costs.

The approach recommended in this chapter emphasizes the importance of assessing the full range of environmental and economic costs which should be considered when making development decisions. Most importantly, this process shows how the costs of development to the taxpayer can be decreased while degradation of the planning area's fragile natural resources can be prevented at the same time. While the SENE Study is not a comprehensive land use plan, the preceding recommendations represent the key steps that land use planners can take to guide the region's future growth.

CHAPTER 4 WATER SUPPLY

The Situation

An average of 26.3 million gallons of water per day (mgd) was supplied to the Buzzards Bay planning area in 1970 through eight public water systems and through several private systems in Westport. The rural towns of Carver and Rochester relied almost entirely on individual private wells.

The largest supplier of water in this planning area is the New Bedford Water Department, which provided 21.5 mgd to the area in 1970. This regional system receives its supplies from the out-of-basin Lakeville Ponds complex (Taunton planning area) and provides water for the total demands of New Bedford and Acushnet. Moreover, the New Bedford system supplied the seasonal peak needs of Dartmouth and Fairhaven. A small number of services in the eastern end of Freetown (in the Taunton planning area) are also served by the New Bedford system.

The primary source of public water supply for the remaining municipalities in the planning area is ground water, accounting for 4.8 mgd in 1970. The total existing safe yield available to the planning area is approximately 28 mgd. Although opportunities exist in many of the municipalities to meet future needs through ground water development, additional surface sources will also have to be developed. Peak demands in the planning area are expected to reach 41 mgd by 1990. The most economical way to serve those needs appears to be expansion of the Lakeville Ponds Reservoir complex and a legal resolution of the ponds' water supply allocation.

Planning Considerations

In developing a water supply program for the Buzzards Bay planning area, a number of important objectives were taken into account. These objectives included: the maximum judicious use of in-basin water resources; the maintenance of existing systems and legal structures; the use of high quality sources of supply; the economic cost of alternatives, including treatment costs where applicable; the proximity of sources of supply to municipalities; the cost savings and operational efficiency afforded by regionalization of systems; and the desired environmental setting of the area, expressed by citizens at Basin Advisory Committee meetings and by the staffs of regional planning agencies.

Generally, ground water is the most economical source for a municipality to develop if the resources exist and if the municipality is willing to make the necessary trade offs to land use which are required to protect the ground water. Because the potential for ground water development capable of meeting 1990 demands is good in all of the planning area municipalities except Dartmouth, Fairhaven, Westport, Marion, and New Bedford, the many individual surface water options which have been identified for the area's municipalities in previous studies have not been recommended. Table 4.1 is a summary of 1970 safe yields, projected 1990 demands, and proposed sources of supply for each of the Buzzards Bay communities. Each of these proposals will be discussed in the following sections.

The Solutions

The New Bedford Water Department

The New Bedford Water Department is the largest system operating in the planning area. The system's service area consists of New Bedford, Acushnet, and portions of Dartmouth, Fairhaven, and Freetown (a Taunton planning area municipality). All residents in New Bedford and about 86 percent of the population in Acushnet were supplied by the system during 1970. Acushnet received New Bedford's water through the publicly owned Acushnet Water Department. The amounts served in 1970 averaged 20.52 mgd and 0.36 mgd, respectively. In addition, about 0.49 mgd were supplied to Dartmouth and 0.17 mgd to Fairhaven by the New Bedford system. Freetown received approximately 0.01 mgd. The New Bedford system provided a total of 21.55 mgd in 1970.

The principal source of the New Bedford Water Department is the out-of-basin Lakeville Ponds complex (in the Taunton planning area), a series of adjoining water bodies consisting of Great and Little Quittacas Ponds, Long Pond, Assawompset Pond, and Pocksha Pond. The waters of Long, Assawompset, and Pocksha Ponds are apportioned under an agreement between the Cities of New Bedford, Taunton, and Fall River. New Bedford's allocation under this agreement is 11.5 mgd, and its water rights to the Great and Little Quittacas Ponds furnish an additional 8.5 mgd. The combined safe yield of all five Lakeville Ponds is approximately 31 mgd (a 5-foot drawdown is used as the basis of the total safe yield since greater drafts will expose large areas of the relatively shallow pond bed). At present, New Bedford shares an overestimated safe yield of 31 mgd from three of the ponds (Long, Assawompset, and Pocksha) with the cities of Taunton (8.0 mgd) and Fall River (11.5 mgd). Their actual safe yield is approximately 22 mgd. Only because Fall River has never exercised its rights to the water of Long Pond, have Taunton and New Bedford been able to meet demands with amounts greater than those allocated under the Tri-City agreement. Fall River has recently com-

pleted the Copicut Reservoir which has an adequate long-range safe yield and the potential for substantial future development. It therefore seems reasonable that Fall River's rights to Long Pond, under the Tri-City Agreement, should be acquired by the other two parties. An estimated yield of 22.3 mgd from Assawompsett, Long, and Pocksha Ponds could then be divided between Taunton and New Bedford, making roughly 1.4 mgd in additional safe yield available to each system.

A number of alternatives have been proposed in previous studies to augment the Lakeville Ponds complex, including further dredging and diking of the existing reservoir system and flood skimming of both the Taunton and the Weweantic Rivers. It is apparent that some additional enlargement of the New Bedford system is required, even if reasonable limitations on water consumption are enforced. Also, as is discussed in the Taunton Planning Area Report, a proposed Taunton Regional System will be developing sources of supply to meet its long-range needs, but will continue to rely entirely on the Ponds to meet its 1990 needs.

A study recently prepared for the City of New Bedford* has recommended that the City immediately begin a ground water development program, focusing initial exploration efforts in three areas of high favorability: at the New Bedford Industrial Park, southwest of the New Bedford Airport, and south of Acushnet Reservoir. If detailed testing of these sites shows conditions favorable for the development of ground water sources, it is estimated that up to 5.2 mgd of additional safe yield could be obtained. Ground water development, in addition to being an economical source of supply, would allow New Bedford to phase its capital expenditures over a period of time, drilling new wells only as additional supplies are needed. It is anticipated that treatment for iron removal would be required on any underground sources developed in the area of the New Bedford Industrial Park.

While ground water development should be sufficient to supply projected additional demands of communities relying on New Bedford through 1990, the SENE Study recommends that the City develop additional surface sources for mid- to long-term needs. Specifically, the dam at Acushnet Reser-

TABLE 4.1 SUMMARY OF 1990 WATER SUPPLY: BUZZARDS BAY PLANNING AREA

Municipality	Existing System (1970) Source	Safe Yield a/ (mgd)	1990 Average Demand (mgd)	1990 Design Demand b/ (mgd)	Proposed Additional Source of Supply
Acushnet	New Bedford Water Dept.	0.36	.77	.77	New Bedford Water Dept.
Carver	Private Wells	---	---	---	Private Wells
Dartmouth	Wells	1.50			Ground Water and New Bedford Water Dept.
	New Bedford Water Dept.	0.49			
		1.99	2.23	4.46	
Fairhaven	Wells	1.14			Ground Water and New Bedford Water Dept.
	New Bedford Water Dept.	0.17			
		1.31	1.60	3.30	
Marion	Wells	1.15	1.15	2.46	Ground Water
Mattapoisett	Wells	2.05	.73	1.63	None
New Bedford	Lakeville Ponds	20.00	20.98	20.98	Ground Water and Acushnet Reservoir
Rochester	Private Wells	---	---	---	Private Wells
Wareham	Wells	3.52			Ground Water
	Jonathan Pond	0.40			
		3.92	3.56	6.73	
Westport	Wells	0.04	.47	1.10	Ground Water and Fall River Water Dept.

a/ Ground water yield is reported as pumping capacity of system.
b/ Systems relying primarily on ground water sources must supply maximum day needs.

*City of New Bedford: Report on Water Works Improvements and Supply Distribution Financing; Camp, Dresser & McKee (February 1971).

voir should be reconstructed to raise the maximum water level and increase its existing storage capacity. It has been estimated* that an increase of 7 feet in the reservoir's elevation would provide an additional safe yield of 3.5 mgd over and above the 1.0 mgd safe yield presently being used for industrial water supply. Treatment of this source could be accomplished through construction of a pumping station and pipeline to the new filtration plant at Little Quittacas Pond. The elevation of Acushnet Reservoir, in conjunction with the proposed ground water development (up to 5.2 mgd) and New Bedford's expanded share of the Lakeville Ponds complex (21.4 mgd), would provide approximately 30.1 mgd for distribution by the City, an amount sufficient to supply projected demands on the system through 2020.

The SENE Study recommendations are as follows:

1. **Reapportion Fall River's Lakeville Ponds rights to New Bedford and Taunton. The municipalities of New Bedford and Taunton should petition the General Court for the reapportionment of Fall River's rights to the Lakeville Ponds supply between the two cities to assure short-term water supplies.**

2. **Develop ground water sources in New Bedford and Acushnet. The New Bedford system should immediately undertake a program of exploration and testing in areas of New Bedford and Acushnet identified as having high favorability for ground water development. These sources are needed now, and if developed to full potential, they should be sufficient to meet anticipated demands on the system through 1990. New Bedford should also investigate the feasibility of elevating the dam at Acushnet Reservoir to provide additional safe yield for supplying the area's long-term water needs.**

Table 4.2 lists the projected supplies and demands of the New Bedford system for 1970, 1990, and 2020. New Bedford and Acushnet will continue to be completely served by the New Bedford Water Department, while Dartmouth and Fairhaven will continue to receive supplementary supplies from that system.

The Department of Public Works in Dartmouth supplies the town's water demands through its Water Works Division, which operates four gravel-packed wells with a total pumping capacity of 1.5 mgd. Since the town has no surface water sources, water demands in excess of this figure are supplied by the New Bedford Water Department. An average of 1.28 mgd was supplied to the town's population in the year 1970. A 0.25 mgd - 0.50 mgd well site near the northwestern part of Dartmouth, near the Dartmouth-Westport boundary line, is also available as a source of supply. Ground water, as the most economical source of supply, is highly recommended to help defer Dartmouth's further cost for water supply.

However, even if reasonable water conservation measures are successful in Dartmouth, the municipality will need to rely on the New Bedford system to meet its 1990 maximum day demand of 4.5 mgd. Exploration in Dartmouth has shown that geologic conditions are not favorable for meeting all of its 1990 demands with ground water. The recent completion of a connection to the New Bedford system at High Hill Reservoir, together with the careful operation and maintenance of Dartmouth's ground water sources, appears to be the most feasible way to supply the municipality's present and future water needs.

All of Fairhaven's population is supplied by the Fairhaven Water Department, and average consumption was 1.1 mgd in 1970. The system owns wells in Fairhaven and Mattapoisett. The municipality's estimated peak demands for 1990 are 3.3 mgd. Further ground water development is limited in Fairhaven, and it appears that the system may look to Mattapoisett for future supplies. Test work completed in Mattapoisett, however, has thus far shown a ground water development potential of only about 0.3 mgd. This amount is too small to justify the cost of connection to Fairhaven's distribution system. The recent construction of two 12-inch mains connecting Fairhaven to the New Bedford system indicates that the bulk of this municipality's future water needs will probably be supplied by the New Bedford Water Department.

The SENE Study makes the following recommendation:

3. **Maintain close cooperation between New Bedford system and Dartmouth and Fairhaven. The municipalities of Dartmouth and Fairhaven should maintain their close cooperation with the New Bedford Water Department as their primary source of supply for mid- and long-term water needs.**

Municipalities Relying on Ground Water.

During 1970, the Mattapoisett Water Department provided the town with an average of 0.32 mgd. The system's available yield of 1.05 mgd has been increased to 2.05 mgd by a new gravel-packed well. The present capacity of these sources appears to be more than adequate to meet Matta-

*City of New Bedford: Report on Water Works Improvements and Supply Distribution Financing; Camp, Dresser & McKee (February 1971).

poisett's 1990 peak needs, estimated at 1.63 mgd.

Water resources within the municipality of Marion are limited, so approximately 75 percent of the water from wells owned by the municipality is obtained from Rochester. Combined sources from both municipalities yield approximately 1.15 mgd (0.29 mgd from wells in Marion and 0.86 mgd from wells in Rochester). Supply to Marion in 1970 averaged 0.52 mgd.

Marion can probably develop additional ground water sources in Rochester to satisfy its future peak demand of 2.46 mgd. An agreement has been made by Marion to supply Rochester, if requested, with 50 percent of the yield of any well developed in that community after 1970. Another alternative for Marion might be to obtain water from the New Bedford system. However, this alternative involves a much larger expenditure since water lines will have to be brought from New Bedford. Although Mattapoisett is closer to Marion, no alternative is proposed involving the use of Mattapoisett's sources since this town is already sharing its ground water with Fairhaven.

The SENE Study's recommendation is as follows:

4. **Develop ground water sources to serve Mattapoisett and Marion. Mattapoisett should maintain local ground water resources, and Marion should develop ground water in Rochester, to meet mid- and long-term water supply needs.**

TABLE 4.2 WATER SUPPLIES AND DEMANDS OF THE NEW BEDFORD WATER DEPARTMENT 1970 - 1990 - 2020

SOURCE		SUPPLIES Available Yield (mgd)		
		1970	1990	2020
Lakeville Ponds				
Assawompset Pond, Long Pond, Pocksha Pond		11.5	1.4	21.4
Little Quittacas Pond, Great Quittacas Pond		8.5	20.0	
Ground Water				
New Bedford and Acushnet			5.2	5.2
Acushnet Reservoir				
Elevation of Dam				3.5
	Totals	20.0	26.6	30.1
MUNICIPALITY		**DEMANDS Average Demands (mgd)[a]**		
		1970	1990	2020
New Bedford		20.52	20.98	22.4
Acushnet		0.36	0.77	1.7[b]
Dartmouth		0.49[c]	0.23	1.8
Fairhaven		0.17	0.16	0.8
Freetown		0.01	0.01	0.02
	Totals	21.55	22.15	26.7

[a] Represents demands of each municipality on regional water sources (i.e. average demands exceeding yield of municipal supplies).

[b] Assumes that Acushnet will elect to continue acquiring its full supply from New Bedford rather than develop potential local ground and surface sources.

[c] 1971 datum.

There are several small water companies in Westport, of which the Westport Harbor Aqueduct Company is the largest. In 1970, this system supplied an average of 0.04 mgd to about 347 people in the town. The system's sources consist of two wells which have an unknown available yield. Westport is expected to register only a small increase in demand by 1990. Since population is expected to grow in the northern part of the municipality, this area's water supply might best be served by the nearby sources of the Fall River system. Service to the southern portion of the town will probably be best supplied by wells.

The Study's recommendation is as follows:

5. **Rely on ground water sources and Fall River system to supply Westport. The southern section of Westport should rely on ground water as its primary source of supply; the northern section should establish an interconnection with the adjacent Fall River system.**

Both Carver and Rochester are well endowed with ground water resources. Because of low anticipated future demands, however, neither community anticipates developing a public water supply system. As indicated above, Marion has agreed to share the yield of its new wells with Rochester, should that municipality decide that a public water supply is required.

Wareham is served by two independent water systems, the Wareham Fire District, which serves the western portion of the town, and the Onset Fire District, which serves the eastern section. The Wareham Fire District supplied an average of 0.64 mgd on 1970 from three wells with a pumping capacity of 2.1 mgd. The district also has a well with a 0.7 mgd yield in reserve. The sources of the Onset Fire District consist of a 0.72 mgd well and Jonathan Pond, which has a sustainable yield of 0.4 mgd and an emergency yield of 2.0 mgd. This system met a 1970 demand of 0.84 mgd.

Wareham may well have the second largest 1990 water demand within the Buzzards Bay planning area. Its present ground water sources will have to be increased to meet an estimated 1990 maximum day demand of 6.73 mgd. Since the municipality has plentiful ground water reserves, the projected demand can probably be supplied entirely from local sources. If emergency supplies are necessary, Wareham could arrange for connections with Carver or with Plymouth, a nearby out-of-basin municipality.

The SENE Study's recommendation is as follows:

6. **Maintain ground water as Wareham's primary source of supply. Wareham should maintain ground water sites as its primary source of supply. Because of its anticipated high seasonal demands, the municipality should, within the next five years, enter into an agreement with either Carver or Plymouth (a municipality in the South Shore planning area) establishing an interconnection to meet emergency water needs.**

Given the above discussion of existing resources and demands, the following general ground water protection recommendations are made for all towns in the Buzzards Bay planning area, except for New Bedford which relies entirely on surface sources:

7. **Undertake well exploration, testing, and site acquisition in Buzzards Bay communities. All communities in the Buzzards Bay planning area whose future water supply would best be provided from ground water sources should undertake continuing well exploration, testing, and site acquisition programs with the objective of completely evaluating their ground water resources. They should acquire, as soon as possible, well sites at least sufficient for projected 2020 demands. Wells requiring some treatment should be acquired if they are the best available** *(see Table 4.1).*

8. **Conduct ground water survey by U. S. Geological Survey and Water Resources Commission. A continuing program should be authorized by the General Court to produce a survey by the Water Resources Commission, in cooperation with the U. S. Geological Survey, of ground water location, quantity, and availability in the region for the purposes of: providing information to assist municipalities in designing their exploration programs for well sites; providing information to assist regional agencies in evaluation of future needs to supplement ground water; providing data necessary for the regulation, protection, and preservation of ground water resources. Funding should come from the Water Resources Commission, the U. S. Geological Survey, and the municipalities involved.**

9. **Adopt or continue metering policies in Buzzards Bay municipalities.** All water works in the Buzzards Bay planning area should adopt or continue metering policies to discourage waste by users, to allow determination of leakage from mains, and to provide data for planning system management.

10. **Investigate advantages of water system cooperation in Buzzards Bay municipalities.** Public water works agencies in the Buzzards Bay planning area should investigate the advantages and economies which may be possible through closer cooperation, including sharing technical personnel and facilities, common purchasing, and operational efficiency.

CHAPTER 5 WATER QUALITY

The Situation

Of all the planning areas in the SENE region, the Buzzards Bay coastal planning area has been given the second highest priority for water quality planning funds by the agencies participating in the SENE Study. Based solely on severity and complexity of water quality problems throughout the SENE portion of Massachusetts, this area received the highest priority determined by the Massachusetts Division of Water Pollution Control. Within the area, emphasis should be placed on control and abatement of combined sewer overflows in New Bedford. Partial separation may be appropriate in limited areas. However, due to the potential problems associated with urban runoff, a treatment scheme, either at the upgraded municipal facility or at overflow areas, is the most positive approach to ensure demonstrable water quality improvements.

The coastal waters of Buzzards Bay are being polluted by wastewater from municipal treatment facilities, combined sewers, private domestic and industrial sewer outlets, and wastes thrown or pumped from vessels. In the Acushnet River, New Bedford Harbor, and Clark Cove, these pollutants have made the water unsuitable for most water uses. Degraded water quality has also decreased the annual shellfish harvest in the vicinity of Wareham, Marion, Mattapoisett, Fairhaven, New Bedford, and Dartmouth.

The proposed water quality goal for the rivers and streams of the planning area is Class B while all salt waters have goals of Class SA, with the exception of New Bedford Harbor, for which a Class SB goal has been adopted.

As previously implied, the most severely degraded waters are found in the Acushnet River and New Bedford Harbor. The river begins in northern Acushnet at the outlet of New Bedford Reservoir and flows generally south to the New Bedford City Line. Beyond the dam at the Acushnet Sawmill, the river is tidal and continues south to Popes Island and the Route 6 bridge. This point is considered to be the boundary between the river and the harbor. Approximately 1.3 miles below the bridge, the mouth of the harbor is narrowed by a tall, stone barrier. Erected by the Corps of Engineers, this 4,500 foot long dike, plus other dike sections, provide tidal flood protection to New Bedford Harbor and Clark Cove. During severe storms, the 150 foot wide navigation opening is closed.

In the Town of Acushnet, industries and individual homes discharge wastes directly to the Acushnet River and Inner New Bedford Harbor. This causes water quality well below the Class SB goal. Water quality consultants have recommended that the town proceed with planning for connection to a New Bedford treatment system. Fairhaven, meanwhile, has recently completed an extended aeration wastewater treatment facility. The effluent from this plant is discharged inside the hurricane barrier. The barrier does not affect the dilution of the Fairhaven wastes. Studies have shown that the volume flushed in the harbor has not significantly changed with its construction. The barrier does trap floating material.

In New Bedford, the western bank of the Acushnet River is heavily industrialized, and the combined sewer outfalls and a number of industrial waste discharges are the key determinants of existing water quality. It has been estimated that complete separation of the combined system would cost 90 million dollars. Two major problem areas are located at the Sawyer Street Pumping Station and Coffin Avenue Pumping Station.

Beyond the hurricane barrier, the harbor broadens into Buzzards Bay. To the east is Sconticut Neck in Fairhaven and to the west is a peninsula which is part of New Bedford. At the tip of this peninsula lies Fort Rodman, the site of a primary wastewater treatment facility which serves most of New Bedford and a small portion of Dartmouth and Acushnet.

Dartmouth, however, has a secondary facility which serves the center of town and discharges to the bay. Despite this, Apponagansett Bay water quality is Class SB. Possible individual discharges, urban runoff, and watercraft wastes are preventing attainment of Class SA goals.

A similar situation exists in Sippican Harbor, Marion. The town operates a secondary facility (lagoons) with discharge to Aucoot Cove except in the summer when the effluent is held. However, for the same reasons as stated above, Sippican Harbor is Class SB, below the SA goal.

Other areas below the SA goals, but of SB quality include Mattapoisett Harbor, and the Wareham and Agawam Rivers. The probable causes of the SB classification are malfunctioning septic systems, direct discharges by individual homeowners, vessel pollution, and urban runoff.

The communities which currently have some form of municipal sewage system are listed below in Table 5.1.

The Solutions

Restoration

While the Massachusetts Division of Water Pollution Control has not, as yet, developed the required basin plan to address the preceding problems, proposals have been put forth by the municipal consultants, the Southeastern Regional Planning and Economic Development District (SRPEDD), and peripherally by the Boston Harbor-Eastern Massachusetts Metropolitan Area Wastewater Management (EMMA) Study. As a result, the SENE Study recommends that the following facilities proposals be included in the basin plan and be implemented by the municipalities.

1. **Upgrade New Bedford's treatment facility to secondary.** New Bedford should upgrade its existing primary facility to secondary and should continue service to a portion of Dartmouth and New Bedford. The plant should be expanded to accept all wastewater flows from Acushnet. Portions of Lakeville and Freetown will also be served. Discharge will be to Buzzards Bay. The timing and manner of this upgrading should be reviewed in SRPEDD's current 208 Study.

2. **Eliminate combined sewer discharges to Clark Cove.** New Bedford's combined sewer discharges to Clark Cove in Buzzards Bay should be eliminated through separation or construction of an interceptor sewer to deliver all combined wastewater for treatment at the expanded facility. Partial separation in conjunction with treatment techniques should be investigated to eliminate as many Inner Harbor combined discharges as possible. [Final recommendations concerning the combined sewer problem must necessarily depend on a detailed engineering study. This is required by the federal construction grant.]

3. **Expand Fairhaven's existing secondary treatment facility.** Fairhaven should expand its existing secondary treatment facility to provide service to Mattapoisett (currently has a small collection system without treatment). The outfall should be relocated outside of hurricane barrier.

4. **Expand and upgrade Marion's existing secondary facility.** Marion will expand and upgrade the quality of its existing secondary facility, with an outfall to Aucoot Cove.

5. **Maintain secondary treatment facility in Dartmouth.** Dartmouth will continue with its existing secondary treatment facility.

6. **Maintain secondary treatment facility in Wareham.** Wareham will maintain its secondary treatment facility with land disposal. Service will be provided to the Buzzards Bay side of the Cape Cod canal in Bourne, requiring an expansion of the collection system.

7. **Construct advanced wastewater treatment facilities in Westport.** Westport, by 1990, may need the construction of two advanced wastewater treatment facilities in order to protect the high quality waters of the East Branch of the Westport River and Westport Harbor. The Northwestern section could be served by the Fall River facility. Measures which will result in no discharge regardless of treatment should be considered and implemented.

Treatment or elimination of combined sewer overflows and moving the outfall from Fairhaven's plant should achieve the Harbor's SB goals. The possibility of the Westport treatment plant will be considered in the SRPEDD 208 Study.

TABLE 5.1 SEWER SERVICE: BUZZARDS BAY PLANNING AREA

Sewer Systems	1970 Population Served	Degree of Treatment	Receiving Waters
New Bedford	100,260	Primary	Buzzards Bay
Fairhaven	10,250	Secondary	New Bedford Harbor
Dartmouth	1,500	Secondary	Buzzards Bay
Marion	2,000	Secondary	Aucoot Cove
Wareham	9,460	Secondary	Ground

Preliminary investigations by the EMMA Study have indicated a potential spray irrigation site in the Bourne-Plymouth area, including 600 acres in Wareham. Detailed site investigations will be necessary to determine its suitability. In addition, its considerable distance from existing population centers could make it an expensive alternative.

Another potential land disposal site has been identified by the EMMA Study north of Westport in Fall River, Freetown, and Dartmouth. The distance to this potential site is considerable, especially from a potential plant on Westport Harbor. Connection to Fall River for the entire town may be the best alternative to advanced treatment.

Preliminary cost figures representing major interceptors and treatment facilities for each of the above proposals are: New Bedford – $28,000,000; Acushnet – $1,000,000; Marion – $600,000; Dartmouth – no new major interceptors or facility capital costs; Westport is in such a preliminary phase that costs cannot be determined. These alternatives were generally the least expensive for each town. In addition, this approach sought to maximize regionalization in order to provide more efficient treatment and fewer discharges.

Preservation

While much of the foregoing discussion has painted a rather grim picture of pollution in Buzzards Bay, it should be stressed that the only area with water quality unsuitable for swimming and other water contact recreation is New Bedford Harbor itself and its tributary, the Acushnet River. Buzzards Bay is an excellent recreational water resource, and needs protection as such. There are several appropriate recommendations for preservation of the high quality streams and coastal waters.

The SENE Study endorses the anti-degradation policies of the Massachusetts Division of Water Pollution Control as presented in the Water Quality Standards. These require that the Department of Environmental Quality Engineering ensure that no new discharges will deteriorate the quality of the stream above the most upstream municipal discharge or will be allowed to enter Class SA or SB waters (shellfish flats and swimmable-fishable salt water). The only exceptions should be allowed under the following conditions:

(a) to allow new cooling water discharges if standards of the receiving waters are met;

(b) to allow new municipal discharges if part of an overall comprehensive plan; and

(c) to require existing discharges to cease and either connect to a municipal system or, if a municipal system is unavailable, to install the highest degree of treatment available so as not to degrade the high quality receiving water.

These requirements apply for all surface waters in the Buzzards Bay planning area, since all have SA, SB, A, or B goals. They also recognize that there are certain waters which simply should not be subjected to wastewater discharges at any time, regardless of degree of treatment. The reasons include the size and sensitive nature of the stream of coastal water, general aesthetic considerations, development pressures, and resultant degradation which may accompany a discharge.

Another threat to water quality is malfunctioning septic systems, a problem in several planning area communities. These have resulted in the preceding proposals for sewer service and attendant treatment facilities. Rigid enforcement of existing regulations may preclude many of the problems of these systems. However, an in-depth look at the criteria for locating, siting, and designing individual subsurface disposal systems is also necessary, since aspects of existing regulations may still allow problems to develop. For example, high percolation rates coupled with the minimum allowable depth to ground water may result in bacterial contamination, nitrate build-up, or even phosphate build-up in that ground water. Also, allowing systems to be placed in fill material might invite clogging conditions at the fill-old surface interface.

Massachusetts has contemplated reviewing and updating its regulations regarding individual disposal systems, and there is strong public sentiment in favor of this. With proper enforcement, and by restricting the use of such systems to those lands suitable for septic tanks, individual disposal systems should continue to be useful for an important portion of future residential development. Without such precautions, the cumulative failure of individual systems will intensify pressure for sewer extensions and new treatment works. The result will be new concentrations of effluent in previously high quality streams, loss of in-basin ground water resources, increased municipal service costs, and, inevitably, the increased density of development induced by sewer service.

Increasing use of dry disposal systems in individual residences may, in the future, alleviate some of the problems of of septic systems. The only residue is a small quantity of compost, which can be removed about once a year. Wastewater from kitchen and bathroom sinks, showers and tubs must still be disposed in septic tanks or sewer systems, however. The objective of this dry disposal alternative would be to provide individual disposal systems which will not only prevent human health hazards on-site, but will also prevent water quality degradation. Benefits will also be derived by the receiving watercourse if the need for sewers, and therefore effluent outfalls, can be delayed or eliminated by these dry disposal systems.

Based upon the foregoing discussion:

8. Enforce local subsurface disposal regulations.

Together with the Department of Environmental Quality Engineering, municipalities should improve enforcement of local regulations governing subsurface disposal systems. Municipalities should also give consideration to selectively allowing innovative dry or "composting" disposal units.

Additional Water Quality Considerations

As in other coastal basins, wastes from recreational craft may well be a threat to shellfish and bathing areas. In certain cases, the anticipated U. S. Coast Guard regulations regarding marine sanitation devices will allow certified discharges. However, the goal of the regulations appears to be the eventual elimination of all discharges. In order to facilitate this:

9. **Construct pump-out facilities. Pump-out facilities should be constructed at coastal treatment plants or at marinas with tie-ins to municipal sewers to convey vessel wastewaters to treatment facilities.**

This basin also has a potential problem with regard to pesticides. The Weweantic River and its tributaries drain an area of approximately 50 square miles in Middleborough, Carver, Wareham, and Rochester containing a large number of cranberry bogs which are treated with a variety of chemicals for the control of pests, weeds, and algae. The principal pesticide currently used on a yearly basis is the organophosphate, parathion. Dichlobenil is a typical compound used for weed control, and copper sulfate is the major algicide used. Limited use of fertilizers also occurs.

The bogs can be considered to be reservoirs for persistent compounds such as dieldrin and DDT. Because of these unacceptable levels of contamination, the SENE Study has not recommended the diversion of the Weweantic River for New Bedford's water supply (see *Chapter 4*).

Finally, several area communities are experiencing landfill-related pollution problems. While proper siting of solid waste disposal sites in accordance with sanitary landfill regulations should be sufficient to prevent future degradation of water resources, corrective measures should also be taken to prevent further degradation of water resources. Municipalities in the planning area which have problems with surface drainage and leachate and with the lowest portion of the fill in the water table are: New Bedford, Mattapoisett, South Carver, and Wareham. Rochester's landfill exhibits the first two problems only. The SENE Study makes the following recommendation:

10. **Operate and locate landfills in accordance with sound sanitary landfill regulations. Further field investigations by the Department of Environmental Quality Engineering are needed to better define the water quality problems associated with existing and abandoned solid waste disposal areas located adjacent to surface waters in the planning area.**

CHAPTER 6 OUTDOOR RECREATION

Although there is little formally designated recreation land in the Buzzards Bay planning area, there are tremendous recreational opportunities. Over 85 percent of the planning area is either forest land, agricultural lands, wetland, or open water. Inland portions are rolling hills and pine forests with some extensive wetlands. The coastline is indented by numerous coves and small estuaries and is very irregular. There are many small beaches, but few major stretches. Recreational boating is heavy and there is potential for increasing boating facilities.

The planning area has a relatively low population density, and New Bedford is its only large city. The area serves to some extent as a vacation and summer home area, but it does not presently approach Cape Cod as a recreational area. Indeed, compared with the Cape, Buzzards Bay is undiscovered.

Both coastal and inland resources provide opportunities for satisfying some of the planning area and regional demand for swimming, boating, hiking, picnicking, camping, hunting, fishing, and extensive outdoor recreation activities such as nature study. These resources should be managed so as to accommodate recreational demands but with special attention to protecting the most critical resources.

SWIMMING

The Situation

The general shoreline of the Buzzards Bay planning area is very ragged and is made up of long stretches of gravel and boulders, with sandy beaches in the Westport and Wareham areas.

There are approximately 40 active public and private beaches along the shoreline. Some are state or town beaches and are used extensively. Others are private; they may or may not be open to the public, and may or may not be used extensively. Half of the 22 miles of coastal beaches, totaling about 57 acres, are publicly accessible. While potentially another ten acres of beach could be developed for public swimming, in addition to those already publicly accessible, the planning area will need another 40 acres to satisfy the planning area's 1990 beach bathing needs.

In addition to demands within the planning area, however, beaches along the Buzzards Bay coast also attract bathers from the Providence metropolitan area, and from the Boston to Brockton suburban corridor. Vehicular access to the Horseneck Beach State Reservation is well-developed. The recently constructed Route 88 connects the large state operated parking area at the beach directly to Interstate 195. These roads put the beach within a one-hour range from Providence, and an hour and a half from Boston.

As pointed out in Chapter 6 of the Regional Report, problems related to satisfying swimming needs involve: inadequa access; inadequate parking, transportation, and toilet faciliti at existing beaches; and erosion of beach areas caused by human misuse and natural forces. Much of the privately owned beach-front along Buzzards Bay is casually used by the public. This circumstance, while adequate for local neec is inefficient for satisfying the beach needs of the entire planning area in the long-run.

Massachusetts residents do not have a "free" right of access along the foreshore. This was confirmed in July, 1974, when the Massachusetts Supreme Judicial Court ruled unconstitutional proposed legislation to codify a general public right to the foreshore (H.B. No. 6438). The public has limited rights, dating to Colonial times, with respect to "angling" and "fowling" and navigation uses, but these need clarification in modern terms.

A Special Legislative Commission on Availability and Accessibility of Public Beaches is continuing to consider alternative ways of opening more Massachusetts beaches to the public. A current report suggests three kinds of action: equalizing parking fees at town beaches for residents and non-residents; requiring non-profit organizations holding tax-exempt status to permit public access to beach property; and automatically opening beaches and property that remain unposted and open to the public for over five years under a right of way dedication statute. There are serious problems with each of these actions; for example, the "dedication to public use" provision might well stimulate private property owners to close beach access presently unofficially open to the public to prevent loss of the private status.

The Solutions

Three options for satisfying beach needs were evaluated in Chapter 6 of the Regional Report, some of them with stronger economic implications than environmental, and others with strong environmental implications. The following recommendations represent a balance between the two extremes. They insure high quality beach bathing experiences, adequate to satisfy 1990 needs, but they are also cost-efficient.

Recommendations

The SENE study encourages the Commonwealth to:

1. **Secure public access to the shoreline. The Commonwealth should continue, as a matter of policy, efforts to secure public access to the coastal shoreline, with careful regard for the protection of fragile ecosystems and for minimizing negative impacts on affected communities and individuals. In view of severely limited public access rights to the foreshore, the Commonwealth should pursue an implementable clarification of the angling-fowling-navigation rights granted in Colonial times. The Commonwealth should also consider possibilities of various means of state sharing of costs of access, traffic control, facility development, and maintenance and operation in return for general public access to Town beaches. User fees should be carefully addressed as a means of direct beneficiaries bearing a portion of the cost, including use on the basis of such fees. The Commonwealth should also continue to explore other alternatives for legislation and programs to improve public access to the foreshore generally.**

Horseneck State Beach is the major regional facility in this planning area. It is one segment of a 5 to 6 mile coastal stretch of unparalleled beauty and variety, including fragile barrier beaches protecting brackish ponds, salt marshes and rocky shoals interspersed with pocket beaches. Pride in the coastal heritage has resulted in efforts on the part of local authorities and residents to protect and manage the resources. The Town of Westport, and private property owners, including a beach association, have opened beaches for local use. The Massachusetts Audubon Society manages bird nesting habitats along the Dartmouth coast and conservation easements provide public access for seasonal nature walks.

An expected doubling of the swimming demands in the planning area and similar increases in other parts of the SENE region would indicate new pressure for use of this coastal area over the next 15 to 20 years. The SENE Study encourages the towns and local residents to:

2. **Protect and manage the Westport – Dartmouth coastline. The SENE Study has found the coastal resources from Horseneck Point to Demarest Lloyd State Park to be fragile and most valuable for low intensity recreation, fish and wildlife production, and protection of dunes and associated natural systems. Local zoning regulations should prohibit new developments in Critical Environmental Areas in this reach: conservation restrictions are appropriate methods for protecting privately owned critical areas and wildlife habitats. The towns should consider acquiring additional portions of the coastline, should they become available to the market, and manage them for the long-term use of both residents and non-residents.**

An alternative of state expansion of Horseneck Beach along a six mile stretch from Horseneck Point eastward to Demarest Lloyd State Park was considered in the draft Buzzards Bay Planning Area Report. During the 90-day review period, residents and town officials in Dartmouth and Westport expressed intense interest in continuing to protect and manage their own fragile coastal lands. The Commonwealth is considering including areas along a shorter stretch (from the existing state beach westward to the Westport Town Beach) within the permanent acquisition boundaries of the existing Horseneck Reservation, primarily as they become available for acquisition.

The SENE Study endorses this combination of private, local, and state action and urges continued close collaboration in planning and management programs among town planning boards and conservation commissions, land trusts, concerned citizens, and the state agencies.

TABLE 6.1 RECONNAISSANCE OF POTENTIAL FOR RECREATIONAL BOATING FACILITIES *

Municipality	Number of Potential Slips	Number of Potential Moorings	Potential Additional Spaces
Dartmouth	280	310	590
New Bedford	80	370	450
Fairhaven	140	100	240
Mattapoisett	50	50	100
Marion	50	50	100
Wareham	60	670	730
Bourne	150	280	430
	950	2,240	2,640

* These are preliminary estimates and **should not** be construed as justification for marina development or expansion. Further study – either by towns or by the proposed statewide boating advisory committee (see recommendation 5 in *Chapter 6 of the Regional Report*) – is needed to determine capacities for new facilities.

RECREATIONAL BOATING

The Situation

The Buzzards Bay planning area is a prime recreational boating area, accounting for more than 8 percent of the boats based in the SENE region's tidal waterways. The vast majority of the recreational boating demand comes from the contiguous communities within Plymouth and Bristol counties, with much of the remainder from Norfolk and Suffolk counties to the north.

Even though inflation, reflected in higher purchase fuel, and maintenance and service costs, and increased taxes and insurance rates, has dampened boating demand somewhat, an aerial photo count in 1973 showed about 4,300 recreational boats either berthed or moored within the Buzzards Bay planning area. Furthermore, even with dampened demand factors, about 1,800 additional boat spaces could be needed to meet the 1990 demand for the Buzzards Bay area.

While the U. S. Army Corps of Engineers estimates that suitable sites exist for over 2,600 new slips and moorings, even the demand for 1,800 additional spaces would begin to place a stress on the character and resource capability of the area. To meet demands beyond 1990, it would probably be necessary to convert some residential areas to commercial, or to develop more costly facilities. An example of the latter would be creating anchorages by provision of protective breakwaters.

The Solutions

Recommendations

The most feasible means of satisfying 1990 demands for recreational boating in the Buzzards Bay planning area is by expanding existing marina facilities. Without encouragement and guidance to private marina operators, there is no assurance that adequate marina opportunities will be developed.

In Chapter 6 of the Regional Report the formation of a state boating advisory committee has been proposed. It would be composed of state officials from the Departments of Fisheries, Wildlife, and Recreational Vehicles and Environmental Management, and representatives of municipal and boating interests. The purpose of the committee would be to provide a forum for municipal and boating interests to air the issues, to develop building and sanitary regulations for implementation at a local level, and to find ways to use existing marina spaces more efficiently. It could propose regulations for the design of marinas that would minimize disruption of currents, restriction of the tidal prism, excavation in shallow water, and prohibit removal of barrier beaches, filling of wetlands, and filling of shallows beyond the normal high water line.

Specifically, for the Buzzards Bay planning area, the SENE Study recommends:

3. **Guide future marina development.**
   The proposed state boating advisory committee should plan and foster orderly marina development in the Buzzards Bay planning area. Working with towns and private boating interests it should assess the capacities of existing marinas to accommodate additional boats without adverse environmental impacts through such measures as fore-and-aft moorings and high rise dry storage.

4. **Make better use of existing marinas.**
   The proposed state boating advisory committee should assist the private development and modernization of existing facilities, moorings, and launching ramps at Apponagansett Bay, New Bedford-Fairhaven Harbor, Mattapoisett Harbor, Sippican Harbor, Wareham Harbor, and Onset Bay.

The Wildlife and Fisheries section of this report discusses the special qualities of the Westport River estuary. To ensure the island resources and water quality in the River remain untainted, the proposed boating advisory committee and town should pay particular attention to restricting marina development in this area. In addition, the 1972 Westport Master Plan has recognized the need for improving the entrance of Westport Harbor which is hazardous and sometimes impassable because of southwest winds and rocky shoals. The Corps and the Town are presently assessing the situation, including identifying the most cost-effective means of control, if at all.

GENERAL OUTDOOR RECREATION

The Situation

The Buzzards Bay planning area contains roughly 6,500 acres of recreation and conservation lands, or 3 percent of the total area – the second lowest in SENE. Of the 6,500 acres, about 1,830 acres are a part of the Myles Standish State Forest in the town of Carver. About 1,900 acres are town parks and conservation lands. Two thousand-five hun dred (2,500) acres are privately owned by sportsmen's clubs private camps, yacht clubs, boat yards, and various local improvement associations.

Not enough of the planning area's open spaces are publicly

accessible to satisfy 1990 demands for picnicking, camping, and extensive outdoor recreation (e.g. nature study and hiking). The Bureau of Outdoor Recreation estimates that existing facilities could supply over three-quarters of 1990 planning area demands for campsites; only about half the 1990 planning area demands for picnicking; and only about a third of the 1990 planning area demands for extensive outdoor recreation. Given the potential popularity of the planning area's coastal resources for swimming and boating, regional and extra-regional demands will substantially stimulate demands for these facilities.

The Solutions

Recommendations

Additional demands for camping and picnicking in the Buzzards Bay planning area can be readily accommodated by making the most efficient use of existing facilities. The SENE Study recommends:

5. **Develop additional camping at Myles Standish State Forest.** **The Department of Environmental Management should develop additional camping areas in Myles Standish State Forest and should consider adding hiking trails.**

The state should develop plans for meeting recreational demands over the longer run and:

6. **Acquire park land in three adjacent towns.** **The Division of Forest and Parks should consider acquiring up to approximately 4000 acres of forested area around the common boundaries of Marion, Mattapoisett, and Rochester, if it should become available for purchase. The area includes Towers Neck, Tinkham Hill, Haskell and Bear Swamps for camping, picnicking, and extensive outdoor recreation.**

Plate 2 shows the location of Critical Environmental Areas which, as explained in *Chapter 3,* have important roles in natural processes such as coastal flooding and erosion protection, and water supply. These areas require protection. They also can be used to varying degrees for recreation. Therefore the SENE Study recommends:

7. **Use SENE Study maps as open space planning guides.** **Municipalities should plan Critical Environmental Areas identified on SENE Development Capabilities Maps, for open space protection and greenbelt programs. Methods for protecting such resources without outright acquisition are described in *Chapter 3 of the SENE Study Regional Report.***

Implications

These actions will help to meet projected local demands more completely than in any other planning area. Together with existing facilities they would meet nearly all the 1990 needs for camping, nearly three-quarters of the 1990 needs for picnic facilities, and all the 1990 needs for extensive outdoor recreation.

The state plays a strong role in Buzzards Bay recreational development because Myles Standish Forest is already state-owned, and because acquisitions required to satisfy the deficiencies are beyond the local means and jurisdiction of any one community. In other planning areas, new acquisitions are less important for satisfying recreational deficiencies because there are opportunities for expanding existing parks and forests which would be sufficient to satisfy 1990 demands. Multiple use of lands adjacent to storage reservoirs is recommended for other parts of the region, either for major metropolitan centers or where such lands are quite extensive, such as those located within the Taunton planning area. Non-reservoir resources within Buzzards Bay potentially provide better opportunities.

WILDLIFE AND FRESH WATER FISHERIES

The Situation

Although portions of the Buzzards Bay coastline are popular waterfowl hunting spots, the area's fish and wildlife resources are not exceptional when compared with the SENE region as a whole.

Over 80 percent of the planning area's unurbanized land is rated as fair wildlife habitat, of which nearly 70 percent is publicly available for man's wildlife pursuits. About 1,800 acres are publicly owned and open to public hunting; another 105,700 are privately owned and open to non-consumptive and hunting uses. This total, if it remained open and unchanged, would support about 25 percent of the 1990 demands for hunting in the planning area.

The ponded cold water fishery resources in the planning area are fairly insignificant on a regional scale, but there are several miles of unpolluted and productive streams. Public access to fresh water resources is the major obstacle to meeting the planning area's demands for fishing. Of the 106 (5850 acres) fresh water ponds 10 acres and over, only 18 (597 acres) have guaranteed statewide access. Of the nearly 60 miles of stream the amount in public ownership and open to public fishing is negligible. If these waters had adequate public access and were under fisheries management, they could support an estimated 240,000 man-days of fishing, approximately 67 percent of the planning area's 1990 demand.

The Solutions

Chapter 6 of the Regional Report describes four options for satisfying the planning area's future demands for wildlife and two options for future fishing demands and their implications. The following recommendations are based on an evaluation of these options.

Recommendations

Due to the multiple benefits of wetlands for flood damage reduction and wildlife production, the SENE Study has recommended their protection to the maximum extent. This can be done without impairment to the economic growth of the region *(see Chapter 3 of the Regional Report).* The Massachusetts Wetlands Protection Act authorizes municipalities and the state to decide whether or not alteration of wetlands should be permitted, but often their efforts are frustrated by insufficient knowledge or expertise. Recently the Soil Conservation Service has developed a program whereby communities can get technical information about wetlands (and other natural resources) through Conservation District Offices. Because municipalities can protect significant amounts of wetlands through legislative channels, the Study encourages them to enforce the legislation with this recommendation:

8. **Enforce wetlands legislation. Conservation commissions should develop technical and planning information needed to enforce wetlands legislation using the Natural Resources Planning Program administered by the Conservation District Office.**

Outright acquisition is the safest assurance that wildlife habitats will be protected, and the state's responsibilities are to purchase those areas of regional significance *(Chapter 6, SENE Regional Report).* However, smaller wetlands and adjacent or separate uplands are often the most productive ones, and frequently municipalities prefer to control them. Hence, the following recommendation:

9. **Acquire most important wildlife habitats. Communities using Self-Help Funds and/or private interests should acquire wetlands most important for wildlife production (identified on SENE Study single-purpose inventory maps available in NERBC files) throughout the planning area.**

Edges between forest, field, and wetlands are often the most productive wildlife habitats. Some of the Study's major policies involve the protection of prime agricultural soils, wetlands, and unique natural areas (components of SENE Critical Environmental Areas). Actions to protect these resources, *(described in Chapter 3 of the Regional Report),* have secondary benefits for the wildlife enthusiast or hunter because they preserve wildlife habitat.

The Westport River estuary is among the most notable wildlife habitats in the planning area. It embraces a high and varied grouping of resources -- pristine waters, islands with the eastern seaboard's northernmost nesting osprey colonies, an island of religious significance, and more than a thousand acres of salt marsh. Local actions to protect and manage the resources are quite vigorous, including conservation restrictions on about 1000 acres of salt marsh, wildlife management by private landowners, ownership and management by Massachusetts Audubon, and ownership by the Westport Land Conservation Trust. The SENE Study encourages the continuation of these strong local efforts and recommends:

10. **Continue to protect and manage Westport River Islands. Management of islands in the Westport River for wildlife production and conservation by the town, private landowners, and Massachusetts Audubon Society should continue. Special efforts should be made to protect these islands and in particular Great Islands in both the East and West Branch Rivers, Gunning, Big and Little Pine, and Big and Little Spectacle Islands. If the opportunity arises, either the Town of Westport or the Massachusetts Audubon Society should consider purchasing any of the islands to ensure their protection in perpetuity.**

The draft Buzzards Bay Planning Area Report recommended the alternative of acquisition of the seven islands by the Massachusetts Department of Environmental Management (formerly DNR). This final report omitted state acquisition because comments received during the 90-day review period indicated that protection and management of the islands is occurring on a local level.

Productive fresh water fisheries exist in the planning area's ponds, lakes, and streams. The Massachusetts Department of Fisheries, Wildlife, and Recreational Vehicles has an active program of streambank acquisition, and the Public Access Board is legally charged to acquire public access to "great ponds", natural ponds 20 acres and larger for fishing, and natural ponds 10 acres and larger for other recreational purposes. To ensure the availability of fresh water fisheries for future generations the SENE Study recommends:

11. **Designate 10 acre ponds as "Great Ponds". The Massachusetts legislature should change the existing Great Ponds Act to designate ponds 10 acres and larger "great ponds" for fishing.**

12. **Acquire access to productive fishing ponds. The Massachusetts Division of Fisheries and Wildlife should evaluate ponds of "good" or "best" fishing potential and recommend**

where the Public Access Board should acquire access. In the Buzzards Bay planning area there are at least 27 ponds 40 acres and larger, capable of providing over 56,000 man-days of fishing. This lengthy list can be obtained from the SENE single-purpose inventory available from NERBC offices.

13. **Acquire access to productive fishing streams. The Massachusetts Division of Fisheries and Wildlife should recommend to the Public Access Board which streams in the Buzzards Bay planning area have good-best fishing potential and need increased access. Assuming adequate public access and fisheries management, at least 8 streams (identified in SENE Study single-purpose inventory) could provide about 11,000 man-days of fishing per year: East Branch of Westport River, Westport; Shingle Island River, Dartmouth; Copicut River, Dartmouth; Acushnet River, Acushnet; Mattapoisett River, Mattapoisett (recommended in the Regional Report for state acquisition because of regional value for fresh water fishing); Weweantic River, Marion; Wankinco River, Marion; Red Brook, Plymouth, Wareham.**

Implications

Management of Category A and B lands would greatly improve the quality and productivity of wildlife habitat, and could support the projected 1990 hunting demands. Information was not available to ascertain the effectiveness of options such as arranging state management of privately owned wildlife lands in exchange for public access, or the possibility of enlarging the boundaries of state hunting areas. Private organizations also will play increasingly important roles in protecting valuable wildlife habitat to meet needs for nature study and open space. Past experience indicates that most wildlife enjoyment occurs on privately or quasi-privately owned lands. An option of acquiring public access to all wildlife habitat was not recommended, first, because of the expense involved, second because hunting is prohibited in several municipalities, and, third, because public preferences expressed at the Buzzards Bay public workshop did not support the idea of public access to privately-owned land.

The creation of new wetlands was not recommended because the high costs involved in initial outlay would be better spent in preserving wetlands which already exist and are known to be highly productive. However, in the long-run, the Study supports research into creating wetlands, especially using dredged materials.

The combined recommendations for fresh water fishing would succeed in meeting at least 10 percent of the total 1990 demands. The alternative of creating impoundments was not considered because of the high costs and low return on satisfying total 1990 demands.

Recommendations for protecting significant wildlife wetlands and for acquiring streambank access are important steps for implementing the SENE Study policy of protecting Critical Environmental Areas.

CHAPTER 7 MARINE MANAGEMENT

The major marine related issues in the Buzzards Bay planning area concern fisheries, commercial navigation, shellfish and aquaculture, and urban waterfronts. Although discussion in this Planning Area Report will deal only with these topics, additional information on other marine issues can be found in the *SENE Regional Report Chapter 7, Marine Management.* That chapter covers in specific fashion, sections on offshore fisheries, shellfish, and aquaculture, port development, dredged materials disposal, offshore sand and gravel, and urban waterfronts. A more detailed discussion of New Bedford's waterfront redevelopment potentials is included in *"Urban Waters Special Study"*, a separate SENE Study report available from NERBC.

Additional marine related topics, such as recreational boating, beach swimming, and coastal access, can be found in *Chapter 6 of this Planning Report or in the Regional Report.* Similarly, discussions on power plant siting including coastal sites, and regional petroleum needs, including coastal implications for tank farms, are to be found in *Chapter 9, Locating Key Facilities of the Regional Report, or in Chapter 9 of this Planning Area Report.*

The Buzzards Bay area has a long and colorful seafaring tradition. New Bedford, its chief port, was at one time the nation's largest whaling center, and today continues as one of the top fishing ports in Massachusetts. However, its catches have recently declined from a high of about 150 million pounds per year in 1965 to only 75 million pounds in 1973. Recent over-fishing of Georges Bank and other fishing grounds by modern, well-equipped foreign fishing fleets has severely affected the New England fishing industry, and New Bedford is no exception. The trawler fleet has been unable to keep up with advances in fishing technology and its aging vessels are inefficient and thus incapable of meeting the competition of subsidized foreign fleets.

The Bay's shoreline is ragged with estuaries and boulder-strewn promontories which provide shelter anchorages and quiet tidal rivers. These waters have been used for pioneering aquacultural enterprises by private firms under town grants. Aqua-Dynamics, Inc., is operating in Wareham and is engaged in culturing oysters, while Marine Biological Research is based in Acushnet and also has been involved in sea farming.

OFFSHORE FISHERIES

The Situation

As with all SENE fishing ports, New Bedford's principal problem is the massive overfishing of offshore fishing grounds. The SENE fishing fleet has declined sharply in recent years because the Georges Bank and other offshore fishing grounds have been overfished by foreign fleets, and most American boats are relatively old and unable to compete on equal terms.

The domestic fishing fleet at New Bedford has also declined in numbers because of foreign competition, with boats from other Massachusetts ports relocating to New Bedford as a home port. The total tonnage of fish has remained somewhat stable, however, because the decrease in domestic landings has been offset by a large increase in foreign imports. At the same time, the number of fishing vessel trips has decreased as foreign vessels increase in size *(see Chapter 7, Marine Management, Regional Report).*

Although activity has dropped off in terms of tonnage landed, in 1972 New Bedford led New England in value of catch, with 61 million pounds worth $17 million. In the years 1960 to 1972, New Bedford's landings have decreased 30 percent, yet the value of those landings increased 27 percent. The New Bedford area had a total fish volume in 1972 of 58 million pounds, valued at 11 million dollars. Flounder represented 80 percent of total fish volume and 88 percent of total fish value. Cod landings for 1972 represented 13 percent of total fish catch, and 13 percent of the total fish value. Relative to the 1960 data, the various species all exhibited increased value.

The New Bedford area's total shellfish volume for 1972 equaled 3 million pounds, with a value of $7 million. Of this total, sea scallops accounted for 97 percent of the shellfish poundage and 98 percent of its total shellfish value. Over the years, total sea scallop volume and value have declined. For example, from 1960 to 1972, the decrease in sea scallop volume equalled 84 percent, while the decrease in value was 6 percent.

It is widely agreed that fish stocks traditionally found off our northeast coast are now harvested near, or beyond, their capacity to sustain themselves. It follows that any new actions to develop increased volumes should come from "underdeveloped" fisheries resources. In most cases, harvesting these species requires a financial risk, requiring fishing effort, additional processing technology, and new marketing techniques. Three abundant resources that are not fully utilized are offshore crabs, squid, and various mixed finfish species, such as sea herring, dogfish, small silver hake, red hake, and butterfish. Many of these mixed species are now caught regularly, but are not brought ashore due to low market values. These caught, but unused, fish stocks have been estimated to amount to as much as 50 to 75 million pounds, or about 20 to 30 percent of current trawl landings.

The New England Fisheries Development Program seeks to develop the three above-mentioned underutilized resources. It also will encourage new marketing techniques by the industry that should take advantage of the increased consumer demand. These combined actions will hopefully blunt the 70 percent share of the domestic market which foreign imports have captured. Two pilot plants, one in New Bedford, and one in Point Judith, R. I., have been processing two species of crabs, the Jonah and red crab, with technical assistance from the New England Fisheries Development Program. In the case of red crab, a ready market appears to exist. If new markets can be developed for these species it would mean an economic boost to the industry. It has been estimated by fisheries development officials, that an increase of one percent a year in landings for 10 years would mean perhaps another $4.2 million to the fishermen and vessel owners.

The New England Fisheries Program is looking toward developing a method for handling mixed species catches of fish at sea, part of which may be used to make fish blocks. These are frozen blocks of fish flesh, from which fish portions and sticks can be produced. Research is needed, too, to develop an automated system to process large quantities of small, irregular sized fish and to sort them into groups.

The Solutions

Consistent with the SENE Regional Report, the following actions are recommended in order to improve the commercial fisheries of New Bedford.

1. **Continue to support an interim offshore 200-mile economic zone. Local fishermen and politicians should continue to urge the U. S. Congress to extend as soon as possible, the nation's jurisdiction over fisheries to 200-miles offshore or to the edge of the continental shelf. This recommendation would provide better control over the offshore resource base as an interim measure pending final proposals by the Law of the Sea Conference.**

2. **Support national fisheries management policy. A national management policy should be locally supported by the fishing industry. The establishment of this joint federal-state management program would allow limited foreign entry, quota enforcement, seasonal or species control limitations, and fishing gear specifications within the 200-mile economic zone. The objective of the preceding actions would be to increase the supply and variety of fishery products without depleting stocks of any given species.**

3. **Improve market for underutilized fish species. The local commercial fishing industry, with technical assistance from National Marine Fisheries Services under the New England Fisheries Development Program, should actively develop a domestic market for underutilized fish species by applying innovative marketing techniques in educating the public to the use of new fish stocks.**

4. **Accommodate coastal fish facilities through improved planning. The coastal zone management program, in cooperation with Department of Community Affairs, should develop guidelines and provide technical assistance to local planning boards. Such assistance should be provided when making land use or zoning bylaws for shore-based support services for commercial fisheries, such as fish or shellfish processing plants, or updated docking and transshipment facilities. Such planning should also carefully consider Critical Environmental Areas (SENE categories A and B) in order to protect those estuarine resources which are of vital importance to the commercially valuable offshore fisheries.**

5. **Allow privately financed purchase of foreign-built fishing boats. Congress should consider the financing problems of the industry. It should repeal the law prohibiting the purchase and importation of foreign-built fishing vessels to allow their use specifically in depressed fisheries states, if purchased with private capital. Federal monies should not be granted for purchase of such foreign vessels.**

Additional information about federal programs to improve the plight of the fishing industry is contained in *Chapter 7 of the Regional Report.*

COMMERCIAL NAVIGATION

The Situation

The major commercial port in the Buzzards Bay area is New Bedford-Fairhaven, with channel depths maintained to 30 feet and an 8000-foot long hurricane flood protection barrier crossing the harbor mouth. Traffic in 1972 was 474,300 tons, having fallen off from a high of 658,600 tons in 1968. Despite this decline, the harbor, formerly the most active whaling port in the country, has the largest and most pre-eminent fishing port on the east coast, handling 65,300 tons of fish in 1972, or 25 percent of the port's total commerce.

In 1972, New Bedford also handled 374,700 tons of petroleum, although the number of tanker movements declined recently due to greatly increased usage of large oil barges to meet oil requirements. The non-petroleum product cargo tonnage outlook appears bleak (except for fisheries), decreasing 50 percent from 1955 to 1970.

A general cleanup of the waterfront area in conjunction with a vast urban renewal program is presently being undertaken by the city of New Bedford. The main purpose of the plan is to enhance the natural tourist attraction of the area by development of waterfront restaurants, motels, and marinas, thereby improving the economic status of the city's historic district. The South Terminal Project, a $78 million dollar redevelopment effort, includes renewed fish processing industries along newly constructed bulkheads and rebuilt shipping piers.

The Commonwealth of Massachusetts and the city of New Bedford have made the following navigation improvements in the harbor: (1) dredged a channel 1000 feet wide, 25 feet deep, and one mile long in the Acushnet River from a point about ¼ mile above the New Bedford-Fairhaven Bridge to 800 feet below Coggeshall Street Bridge; (2) dredged berthing areas to 30 feet at State Pier; (3) dredged berthing areas to 22 feet at Homers Wharf; (4) dredged berthing areas at Fairhaven Wharves to 15 feet; (5) dredged a 14-acre maneuvering and berthing area at South Maritime Terminal with eight acres to 20-foot depth and six acres to 30 feet; and (6) dredged a 21-acre maneuvering and berthing area to 30 feet at North Maritime Terminal adjacent and upstream of federal maneuvering area.

A 1970 U. S. Army Corps of Engineers study of the New Bedford and Fairhaven Harbor indicated that the present New Bedford deep-draft channel (30 feet) is adequate. The Study also stated that the existing channels along the Fairhaven waterfront required widening, deepening to 15 feet, and a 6-foot deep channel extension in order to adequately accommodate existing and prospective commercial fishing commerce.

The Solutions

The following actions are recommended:

6. **Improve New Bedford's navigational facilities. The U. S. Army Corps of Engineers, in cooperation with the Massachusetts Department of Public Works and the cities of Fairhaven and New Bedford, should improve navigational facilities by: (a) providing a 6-foot deep channel 100 feet wide extending from the existing 10-foot deep channel for a distance of about 600 feet; (b) deepening the 10-foot channel to 15 feet; (c) widening the new and existing 15-foot deep channels.**

7. **Accommodate commercial fisheries through improved planning. The cities of New Bedford and Fairhaven should encourage or expedite private support services for commercial fisheries through local zoning and favorable financing for fish or shellfish processing plants, updated dockage, or transshipment facilities.**

AQUACULTURE

The Situation

Buzzards Bay has numerous inlets, bays, harbors, streams, and flats that support oysters, soft-shell clams, quahogs, bay scallops, and sea clams. Overharvesting, poor town management, pollution, and predators contributed to the steady decline of shellfishing in the Buzzards Bay area during the 1900's. While some flats have never recovered, they still have potential for future use.

With improved water quality, the opening of flats closed by pollution will double the available resource. Increased yields through better management of the 6700 acres of flats and pollution abatement should be sufficient to cover recreational demands through 1990. Resources available to commercial diggers would also be substantially increased.

Research on marine aquaculture has indicated that the species which could withstand biological requirements of the planning area and still make economic returns are: the American oyster (which has been cultured in varying degrees in this country for over a hundred years), the hard clam (quahog), bay scallop, and American lobster. All species are native to the area, all have been successfully cultured through every life state to market size, and all have considerable market value.

The Solutions

Because the availability of suitable coastal areas on Buzzards Bay is limited to protected embayments, intensive culture would be used for these waters in order to provide continual optimum conditions for growth and development. Intensive aquacultural operations can interfere with natural processes, but in Massachusetts, legislation exists which addresses means of resolving this potential conflict. Several aquacultural operations have been initiated on Buzzards Bay within the past five years at Marion, Wareham, and Acushnet with Environmental Devices Corp., Aqua-Dynamics, and Marine Biological Research. The following actions are recommended:

8. **Meet 1977 water quality standards. The Massachusetts Division of Water Pollution Control should take all necessary actions to meet**

1977 water quality standards and enforce the Massachusetts anti-degradation laws prohibiting new discharges into class SA and SB waters in Buzzards Bay *(see Chapter 5, Water Quality)*.

9. **Study estuaries for potential aquaculture operations. Consistent with SENE Study single-purpose inventory maps showing high quality estuaries (included in Category A** *see Chapter 3)* **and the criteria discussed in** *Chapter 7 of the Regional Report,* **the Division of Marine Fisheries should verify the suitability of these areas for intensive aquaculture leasing potential: Sippican Harbor, Mattapoisett Harbor, and Nasketucket Bay.**

10. **Provide increased technical assistance to towns for aquaculture regulation. The Massachusetts Division of Marine Fisheries should be funded to take a more active role in providing technical assistance to communities in locating suitable sites and evaluating private corporations for the necessary technical and administrative qualifications prior to granting aquacultural licenses.**

Four years of research at Woods Hole Oceanographic Institute has proved the successes of using secondary treated wastewater for shellfish propagation. However, continued support is required to solve the major problem in this technique, viral and bacterial contamination. Such research is vital prior to the approval, by the U.S. Department of Health, Education and Welfare, and ultimately the Department of Public Health of this technique for practical application. The Study's recommendation is as follows:

11. **Continue study of secondary treated wastewater for aquacultural use. The New England Regional Commission, with technical support by the state, should fund research such as that at Woods Hole Oceanographic Institute to find techniques for the removal of viral and bacterial contamination from secondary treated wastewater.**

URBAN WATERFRONTS

New England's port cities were largely responsible for the area's rapid economic growth and development in the eighteenth and nineteenth centuries. As noted in New York's "Waterfront Workshop", conducted by the City's Planning Commission in the fall of 1974:

> "Time and technology have left stranded many once-busy segments of the waterfront. Brickyards, stone-yards, lumberyards, and coal terminals have either gone out of business or moved elsewhere. Containerization has shifted the volume of shipping business, and airlines and cruises have transformed passenger ship piers.
>
> "These changes have opened up the waterfront's potential, although in a double-edged fashion: because one type of development usually precludes all other alternatives, proposals may generate counter-proposals. A housing plan is met with the suggestion that a park would be preferable, a plan to site industry may arouse environmentalists, a plan to turn over an idle pier for recreation may be attacked as a blow to shipping. Almost everyone agrees that the shoreline is too valuable to lie fallow, but agreement on a specific plan may be difficult to obtain. This is one of the many contradictions enshrouding the waterfront."

In order to recapture the vitality which lies just beneath the surface of decay and neglect, a few institutional and administrative changes are needed, backed by public awareness. Several cities and towns have initiated or carried out sound programs for waterfront development or renewal, although their success has occurred in spite of, rather than because of, current institutional and public policy.

The Situation

New Bedford's strong waterfront orientation stems from its importance as a 19th century whaling center. Today, the fishing industry is a predominant use of the waterfront. The City's first major redevelopment activities were focused on revitalizing the economic basis of the waterfront. The South Terminal renewal project will provide major bulkheading and fill for waterfront industrial development sites, as well as new access roads and utilities. The project also involves the rehabilitation of the fishing piers. The construction of a hurricane barrier created protected development sites along the harbor and enabled the renewal program to move forward. The North Terminal project is now underway with new downtown commercial and residential redevelopment. In addition to a major shopping mall and new housing, new industrial sites are locating near the waterfront. The City has also developed a harbor master plan.

New Bedford is now implementing a project of preservation and rehabilitation of an historic commercial area near the whaling museum and fishing piers. The project is multipurpose in scope as it aims to enhance New Bedford's historic, cultural, educational, and aesthetic values while also increasing new business and industrial opportunities and tourist potentials. Although once linked directly to the waterfront, this area as well as the rest of New Bed-

ford's central area is now separated from the waterfront by a limited access expressway connector. The historic area's pivotal position between downtown and the waterfront provides justification for bridging the expressway at this location and creating a strong pedestrian access connection between downtown and the waterfront.

Other than the limitations posed by the new expressway connector on access to the waterfront, New Bedford has the advantage of having a fairly accessible waterfront. A City Marine Park on Pope's Island with a fine view of the harbor and public piers near the central area are complemented by city-owned frontage allowing public access to most of the beaches and waterfront along the City's southernmost shoreline outside the hurricane barrier. Fort Rodman, now mostly City-owned, is being developed into an educational/vocational and recreation facility.

Under consideration by the City is a recently published report, "Preservation and Rehabilitation of a Historic Commercial Area," describing a program for the restoration of a historic area linking downtown with the waterfront. It is located just inland of the South Terminal project. The importance of this project was outlined above, and in addition, it is illustrative of the kind of project which will enhance tourism potentials in the City.

The Solutions

Recommendations

By integrating master planning and development control functions in the urban waterfront area, New Bedford can focus public interest and concern on relevant development issues and establish an administrative framework at the local level. In light of the previously discussed options, the following actions are recommended in order to enhance the reuse of urban waterfronts in a rational and balanced manner:

12. **Coordinate local waterfront planning and development.** **New Bedford should prepare an inventory or plan for the long-term use or reuse of waterfront areas. In undertaking such activities, it should give special consideration to factors such as the protection of flood prone areas, the preservation and enhancement of historic sites and buildings, the provision of public access easements (both physical and visual) in new development, building height, and so forth, consistent with Critical Environmental Areas** *as specified in Chapter 3, Guiding Growth, of both this Planning Area Report and the Regional Report.*

While primary responsibility for initiating and carrying out land use decisions should remain at the local level, the state should perform the following critical functions:

13. **Provide guidance and set criteria for priority waterfront uses.** **Massachusetts through the coastal zone management program, with strong local participation, should develop urban waterfront planning and management guidelines and criteria for deciding priorities for uses to be incorporated into local waterfront master plans. Priorities should be established for water-dependent uses, water-using uses, complementary uses, and low-priority uses.**

14. **Review and coordinate waterfront use.** **Massachusetts, through the regional planning agencies and The Department of Community Affairs, should exercise powers to review and revise major waterfront development proposals of more than local concern.**

15. **Provide federal funding for state and local waterfront development plans.** **The U. S. Congress and the Office of Management and Budget should approve adequate federal funding for state coastal zone planning programs, and for other planning programs which enhance waterfront redevelopment.**

Implications

Implementation of coordinated local and state approaches to waterfront use should help to minimize fragmentation of decisions in waterfront areas while recognizing the appropriate roles of the different levels of government. Agreement on appropriate guidelines and priorities should help to reduce conflicts between uses and increase the chances for a variety of uses along urban waterfronts. More sensitive and sensible use of waterfronts will reinforce use of existing infrastructure and help to reutilize urban areas which have considerable economic and aesthetic potential.

CHAPTER 8 FLOODING AND EROSION

With its flat terrain and extensive network of coastal streams and wetland areas, the Buzzards Bay area has experienced little significant riverine flood damages. However, the area is subject to infrequent but severe coastal flooding and erosion, particularly from hurricanes. As in the inland areas, the coastal wetlands help to minimize tidal flooding damage; and with relatively moderate development pressure compared to other SENE planning areas, the opportunity exists to acquire, or otherwise protect, the area's 32,000 acres of inland and coastal wetlands. However, with the higher development pressures expected after the 1990 projection periods, this opportunity must be seized today.

In general, the Study's recommendations emphasize that both inland and coastal flood prone areas should be protected from development by instituting non-structural flood plain management measures wherever possible, including maximizing use of wetlands as natural valley storage areas and applying strict development criteria. Only where there is existing high-value development in small concentrated areas are structural flood protection works recommended. Recognition of the multiple values of wetlands – not just as natural flood retention areas, but for wildlife habitat, water supply, and recreation, as well as landscape quality – further strengthens the importance of wetlands protection as a uniquely valuable means for reducing flood damages.

The Situation

Inland Flooding and Wetlands Protection

Prior riverine flooding in the Buzzards Bay coastal streams planning area has, for the most part, caused little physical damage. Generally, flat topography and an abundance of low marshy land areas and swamps have discouraged development near the courses of rivers and their tributaries. Fresh water wetlands, both open and wooded, in the area total some 26,800 acres, or 14 percent of the planning area. Approximate riverine flood plain areas (100-year frequency storm) amount to nearly 18,000 acres. In addition, numerous ponds and lakes have served to detain runoff and reduce storm flows. The largest of these are Sandy and Halfway Ponds in Plymouth, Island Pond in Plymouth and Wareham, Sampson Pond and Edaville Reservoir in Carver, Snipatuit Pond in Rochester, New Bedford Reservoir in New Bedford, and Noquochoke Lake in Westport.

Northeaster coastal storms very often produce heavy rains and high tides. Prevalent in the winter, although they can occur in any season and are more frequent than hurricanes, northeasters may last from 2 to 4 days and cause isolated, local inland flooding if accompanied by heavy rainfall. Flood damage surveys for each river basin indicate that undersized or poorly maintained culverts, and narrow or restricted waterways are primarily responsible for any local flood problems. With the exception of Paskamanset River (a tributary of the Slocum River) at Route 6 in Dartmouth, where flooding can be attributed to urbanization, the causes of flooding appear to have been due to initial underdesign as well as poor maintenance of culverts.

The Wareham, Weweantic, and Westport West Branch Rivers have no reported riverine flood damage, and do not appear to be prone to such damage as long as present topographical characteristics are maintained. The Acushnet River is free from critical flood damage areas since the waterway corrections were made at Lake Street and Hamlin Road in Acushnet after the spring 1968 storm.

The Sippican, Mattapoisett, and Slocum Rivers have a minor flood damage potential at present. Some damage has occurred from flooding at Marys Pond Road in Rochester at various times. Riverine flooding in the Slocum River watershed is minimized due to large storage areas which include the Acushnet Cedar Swamp and the Apponagansett Swamp. Minor roadway and residential damage may be anticipated if stage heights exceed their floods of records.

Westport East Branch has what appears to be the greatest flood damage potential in the Noquochoke Lake area, where some flooding occurred in 1968. The dam which forms the lake is operated to maintain maximum designed lake storage volume since the lake serves as an auxiliary water supply for Fall River. Thus, when storms raise the lake level even higher, the approximately 150 cottages around the lake are exposed to a potential flood hazard.

In sum, extensive swamps, small streams, and cranberry bogs have both regulated streamflow and discouraged development in flood prone areas, making the Buzzards Bay planning area relatively free of riverine flood damages. The Corps of Engineers estimates that this network of flood storage areas is adequate to protect the planning area from future damages and that no major facilities are needed to control future river flooding in the area. Local land use management to preserve these natural storage areas, and remedial construction and/or maintenance to

correct certain "bottleneck" conditions offer practical approaches, singly or in combination.

The only major inland erosion problems in this planning area are those associated with industrial, commercial, or residential development. Much of the erosion damages can be avoided through a sound urban-environmental forestry program to retain as much of the native vegetation as possible. Pasture and forest land have little or no erosion problems at present, and future upland erosion problems are expected to be minor and be sufficiently handled by conservation land treatment practices. The costs of removing sediment, caused by development, from ditches and catch basins, and of treating erosion problems, once they have developed, can be high.

Coastal Flooding and Erosion

Although tidal flooding in the Buzzards Bay area has been minimized by the wide marshy areas in the tidal zones, there are some flooding and erosion problems: continual coastal erosion, particularly of the erodible sandy beaches; encroachment and misuse of marsh lands; some tidal flooding of low lands with subsequent damage to private and public buildings; and development in the coastal region. Tidal flood plains total some 18,000 acres, according to Corps of Engineers estimates.

Hurricanes are not uncommon to the area and cause extensive shoreline damage when they strike. In addition to severe coastal erosion of 5 to 25 feet in some areas, tidal surges of over 14 feet can occur and inundate large areas of low lying land. In all, 71 hurricanes have been recorded since 1635, of which 35 caused moderate to severe tidal flooding.

In addition to the hurricanes, a large number of other storms occur in the area. These include extra-tropical storms and northeasters. The Buzzards Bay area is relatively protected from the frequent winter northeasters, but they can be stalled in the area for several days and cause higher tides than normal over a longer period of time.

The Corps of Engineers has estimated the recurring tidal flood damages in the Buzzards Bay area at $46 million (recurring 1938 hurricane), with particularly heavy damages expected at Wareham-Marion ($15 million) and New Bedford-Fairhaven ($5.5 million). For the recurrence of a hurricane of the severity of the 1954 storm, the total damage is estimated at $19.5 million, with New Bedford-Fairhaven expected to incur some $4 million in damages and Wareham-Marion $11.1 million.

These damages would have been much higher – up to $78 million in 1964 dollars according to Corps of Engineers estimates – without the tidal flood protection project completed in May 1966 in New Bedford Harbor. The project provided a barrier across the New Bedford-Fairhaven Harbor and supplementary dikes in the Clarks Cove area, protecting the New Bedford-Fairhaven-Acushnet area, excluding the Sconticut Neck area of Fairhaven and the southern end of Clark Point. The project affords complete tidal flood protection for about 1400 acres, which represents about 80 percent of the area flooded during the 1938 hurricane. The barrier is also operated during northeasters and in December 1966, prevented about $460,000 in damages.

A number of reports have been written on coastal protection projects by the Corps of Engineers. A beach protection project for the New Bedford City Beach, on Clark Point, was adopted in October 1962. It provides for federal participation in 50 percent of the first cost of restoring and protecting the city beach. No work has been done on the project, primarily due to lack of local funding support.

A tidal flood protection study, completed by the Corps of Engineers in 1961, recommended improvements at the coastal damage centers of Wareham and Marion to prevent hurricane tidal flood damages by constructing a system of rock-protected, earth-filled barriers and supplemental dikes and walls across the Weweantic River, the Wareham River, and Onset Bay. The project would have cost $6.6 million (1965 dollars) of which $4.6 million would have been federal and $2.0 million would have been local costs; the benefit-cost ratio was 3.9 to 1.0. The plan was designed to protect the area against a standard project flood level of 17.9 feet above mean sea level. With the plan in operation during a recurring hurricane of the 1938 magnitude, damages behind the barrier would be reduced by over $9.6 million from a total of $10.6 million which occurred in 1938. The project was authorized but not funded; local interests were not in favor of the project and no work was ever started. It was reclassified as inactive in April 1965, and is now proposed for deauthorization.

An interim hurricane survey of Massachusetts coastal and tidal areas was completed by the Corps in August 1964. The study was undertaken to investigate means to prevent the loss of human lives and damages to property in areas of lesser hurricane tidal flooding along the entire coast. The report found that complete hurricane flood protection was impractical and uneconomical due to the scattered nature of development and potential damages and the recreational use of the beaches. The Division Engineer recommended that no further federal projects for hurricane protection be undertaken in Massachusetts at that time. However, the report was published with appendices for planning purposes to guide public and private interests in studies for the protection and development of lands, waters, and other natural resources of the coastal areas.

The Corps has identified critical shoreline erosion areas as those where erosion is occurring at rates of over about 3 feet per year. An area requiring immediate remedial work

is the section of Horseneck Beach east of Gooseberry Neck. Non-critical erosion, where erosion at rates less than 3 feet per year may need protection at a future date, has been identified at Horseneck Beach west of Gooseberry Neck.

Coastal wetlands in the Buzzards Bay study area comprise over 4600 acres. Of this total, about 65 percent are found in the towns of Dartmouth, Wareham, and Westport. The following coastal wetlands have been recognized as unique natural areas: Allen Pond, Slocums River, and Demarest Lloyd State Park wetlands in Dartmouth; Nasketucket Bay, West Island, and Fairhaven Wildlife Sanctuary wetlands in Fairhaven; the West and East Branches of the Westport River; and the Horseneck Beach wetlands in Westport.

The Solutions

A number of alternatives were considered for reducing flooding and erosion damages; these are discussed and evaluated in *the Regional Report, Chapter 8.*

Recommendations

A major result of the SENE Study has been the classification of the region's resources according to their capability, *(see Chapter 3).* Inland and coastal wetlands, estuaries, beaches, barrier beaches, and critical coastal erosion areas have been classified as "A" resources, requiring the greatest degree of protection from development. Flood plains and hazardous coastal flooding areas (both to the 100-year flood frequency line) have been classified as "B" resources or other protection areas, which have very limited tolerance for development, but which, with proper management, are suitable for much compatible activity as agriculture or recreation.

In keeping with these resource classifications, it has been recommended *in the Regional Report* that comprehensive flood plain management programs be developed for riverine and coastal flooding areas making use of non-structural solutions wherever possible. All such programs should be developed in close cooperation between federal and state agencies, regional planning agencies, and local governments and interests. They should also be coordinated with related programs, such as the National Flood Insurance Program, flood warning services of the National Weather Service, state wetlands acts, state land use planning programs, and in coastal areas, with state coastal zone management programs.

Section 73 of the Water Resources Development Act of 1974 gives particular impetus to this approach by authorizing federal cost sharing for non-structural flood protection measures. Although implementation of Section 73 has presently been deferred by the Office of Management and Budget, application of the cost sharing authority can be an important factor in making non-structural solutions more competitive than they have been. Thus, the Pilgrim area Resource Conservation and Development (RC&D) project, being sponsored by the Soil Conservation Funds (USDA) and other agencies, may be able to support non-structural as well as structural measures in flood control and natural valley storage protection in the planning area.

In the Buzzards Bay planning area, with short coastal streams almost entirely within single communities, a comprehensive program could be carried out on a municipal basis, unified through the state coastal zone management program and regional planning agency coordination.

Therefore, in the context described above and consistent with the basic policies and approaches described in *the Regional Report:*

1. **Adopt local flood plain zoning to prevent adverse development in flood plains. Municipalities should adopt flood plain zoning to prevent adverse development in flood prone areas (and particularly in the 100-year floodway) as defined under the National Flood Insurance Program.**

All communities, including those already participating in the HUD Flood Insurance Program, should incorporate inland and coastal wetlands, eroding areas, and storms of record on the map upon which the zoning is based. HUD is considering new ways of delineating coastal storm hazard areas in order to make the mapping process and insurance rates more accurately reflect coastal conditions. All related regulations – building codes, subdivision regulations, sanitary codes – should reinforce this policy of preventing adverse development and redevelopment in the 100-year flood plain. The regulations should also take advantage of the restrictive provisions of state wetlands regulation, scenic rivers programs, and the like. As described in *the Regional Report, Chapter 8,* technical assistance should be provided to all officials responsible for enforcing the zoning and related regulations.

Related to local zoning action are three recommendations for controlling local sedimentation and inland erosion problems.

2. **Establish local sediment and erosion control ordinances. Municipalities, assisted by the U. S. Department of Agriculture and the Executive Office of Environmental Affairs, should establish local sediment and erosion control ordinances.**

A model in such ordinances is included in the more detailed information prepared for the Study.

3. **Establish forest buffer zones. Municipalities should establish appropriate forest buffer**

zones within 200 feet of streams and lakes, to preserve vegetation and maintain natural systems through forestry techniques to help keep non-point source pollutants from reaching sensitive water quality areas.

Municipalities with existing high and medium development pressure *(see Chapter 3, Guiding Growth)* should be among the first to implement these two recommendations.

4. **Control forest land erosion. Landowners should control forest land erosion by proper road location and stabilization activities such as seeding and ditching.**

Cooperative federal, state, and local programs are available to implement this situation.

In conjunction with a zoning program:

5. **Acquire significant flood plains and wetlands. Municipalities and state agencies should investigate continuing possibilities to acquire wetlands and flood plain areas most significant for flood damage reduction and protection, and which have water supply, wildlife, and/or recreation values.**

Particular emphasis should be given to protection of areas classified as unique natural areas and those located in areas subject to high and medium development pressure, as described above. More specific actions regarding wetlands protection are included in *Chapter 8 of the Regional Report.* Specific areas are also discussed in the *Outdoor Recreation chapter of this report.*

Protection of wetlands and flood plains is also expected to help existing structural flood protection projects do their job by keeping flood flows to within the design capacity of the existing dams, channels, etc. In built-up and heavily used areas such as New Bedford and Fairhaven, alternative locations outside the flood plain may not always be feasible.

6. **Locate in existing safe buildings in the flood plain. Where location outside the flood plain is not feasible, municipalities should encourage private interests to locate in existing safe buildings on the flood plain, rather than permitting new construction on the flood plain.**

Floodproofing, especially of existing buildings, is particularly appropriate where only moderate flooding is expected, where other types of flood protection are not feasible, or where activities on waterfront location need some degree of protection. Improved and expanded storm and flood forecasting and warning devices recommended in *Chapter 8 of the Regional Report,* will also be important in keeping down future damage costs.

The Regional Report, Chapter 8, contains recommendations for including critical coastal erosion areas in 100-year coastal flood prone areas, and putting this entire coastal flooding zone under the ultimate jurisdiction of the state coastal zone management program. On the local level, recommendation number 1 called for prohibiting development and other damaging uses of critical erosion areas through local flood plain zoning. In addition, municipalities should:

7. **Encourage natural stabilization of coastal erosion areas. Municipalities and conservation commissions should continue to encourage natural means of stabilizing coastal erosion areas, giving priority to areas experiencing critical rates of erosion (3 feet or more per year).**

Use of vegetative cover, snow fences, discarded Christmas trees, and boardwalks have proven effective approaches to control accelerating rates of wind and wave erosion. The Pilgrim area RC&D project may be a source of planning assistance and project funds for coastal erosion control.

No specific sites have been identified for structural erosion control projects in this planning area. However, *Chapter 8 of the Regional Report* recommends selective construction of erosion control projects for areas other than beaches such as eroding bluffs (except for unique natural sites). Artificial beach nourishment does not provide substantial benefits unless public recreational benefits are added in as well. Therefore, further discussion of the possibilities for beach nourishment are included in the *Outdoor Recreation chapter of this report.* Any studies and projects should address the littoral draft relationships between beach erosion and headland protection.

Implications

This overall approach is a good deal more restrictive than the National Flood Insurance Program requires. It does, however, make full recognition of resource limitations and natural functions of wetland and flood plain areas. The SENE Study has found that all new development can be accommodated in C, F, and G lands (as discussed in the *chapter on Guiding Growth),*so that protecting A and B lands from inappropriate use need not be incompatible with a growing economy. In fact, a policy of resource protection and non-structural solutions is regarded as a significant step toward protecting the physical beauty of the region's landscape which, in turn, is expected to be in the long-term interest of the SENE Region.

CHAPTER 9 LOCATING KEY FACILITIES

One of the most difficult subjects to grapple with at the local level is the siting and operation of such key facilities as power plants, sand and gravel pits, and solid waste disposal. Bluntly stated, they are unwelcome neighbors. At the same time, however, few people are willing to live with the consequences of not having enough of the vital products or services provided by these operations. The situation is further complicated by increasing competition from other potential users of the sites which are appropriate for these facilities.

The nature of development in this relatively remote area of the Study region is such that, to date, these have not been controversial issues. However, SENE Study investigations of future development pressure outlined in *Chapter 3 of the Regional Report* indicate significant increases in development activity in the next 20 years. With that development will come increasing demands for sand and gravel for construction and sites for solid waste disposal and power generation.

Unlike most of the other planning areas in the SENE region, the Buzzards Bay area has the potential to manage these needs without conflict to either development goals or environmental aspirations.

The sand and gravel recommendations listed in *Chapter 9 of the Regional Report* would provide statewide survey of potential sand and gravel sites, statewide operating standards under local control and permitting, mandatory site rehabilitation, and state guidance to municipalities on sequential uses of mineral deposit lands. Implementation of these recommendations would provide this area with local sand and gravel sufficient to meet its needs before development preempts extraction.

The Massachusetts solid waste program will provide a much needed method to recover valuable resources from wastes, and thus decrease the disposal problem. The Study endorses the program and urges community participation. In the interim, proper enforcement of existing sanitary landfill regulations would do much to reduce the negative effects on water quality and the natural landscape such activities can have.

Finally, the staff of the Federal Power Commission (FPC) has suggested that the installation of from 1000 to 3000 megawats of nuclear generating capacity after 1990 may be required to help meet local and regional demands. The area was chosen by the FPC because of availability of land and cooling water and proximity to both Providence and Boston service areas. While the program of demand management outlined in *Chapter 9 of the Regional Report* has the potential of reducing the degree of need for additional generation capacity, it may well be likely that at least some additions may be needed. The Study recommends that sites for such additions be secured today through a careful process of site selection with interim recreational use until the unit can be brought "on line".

This program will have the effect, if implemented, of providing to the planning area the resources and facilities needed for future development at the least environmental and economic cost.

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